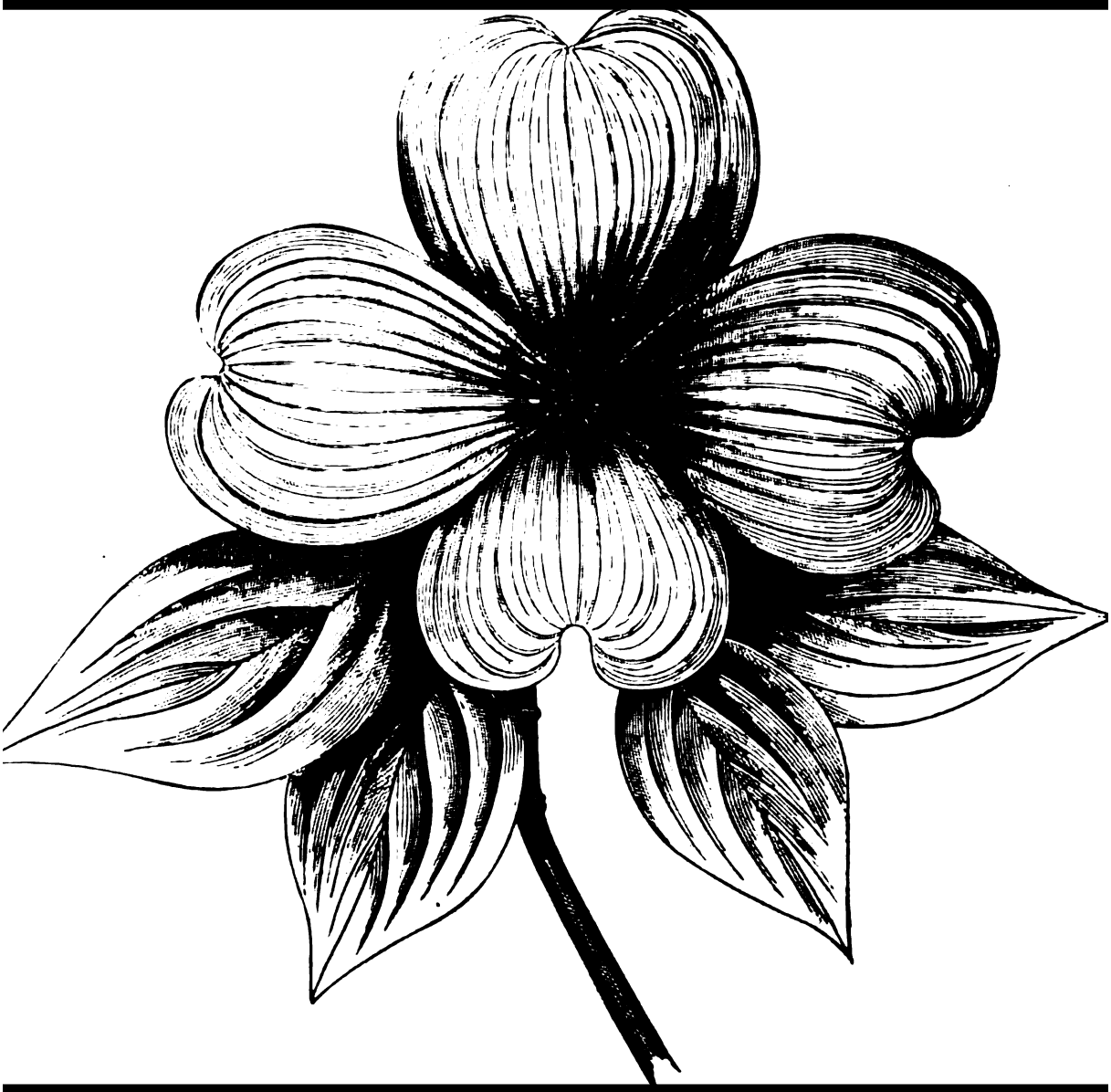

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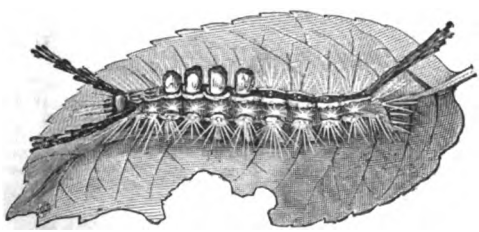

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ERRATA.

Page 5, col. 1, line 11, omit the second "of." Page 6, col. 1, line 2, for ? read ! Page 8, col. 1, line 1, for "thirty" read "twenty." Page 27, col. 2, line 13 from bottom, for "Gold Gilt-beetle" read "Gilt Gold-beetle." Page 31, col. 1, line 30, for "*Culopteron*" read "*Calopteron.*" Page 31, col. 1, line 41, for "No. 8 pin" read "No. 18 pin." Page 32, col. 2, line 10, for "*Gasteracantha*" read "*Gasteracantha.*" Page 45, col. 1, line 17 from bottom, for "35" read "47;" line 12 from bottom, for "33" read "45," and for "34" read "46." Page 85, col. 1, line 23, for "last" read "this." Page 97, over the illustration, for "Fig. 59" read "Fig. 59½." Page 101, col. 2, line 25, for "*Cecropia*" read "*Cecropiæ*;" same column, note, for "*Chalcis maria*" read "*Chalcis mariæ.*" Page 111, col. 1, line 2 from bottom, for "*Peiris*" read "*Pieris.*" Page 131, col. 1, line 10 from bottom, for "oval" read "oblong-oval." Page 152, col. 1, line 21, for "one" read "our." Page 163, col. 2, line 6, for "results" read "result." Page 168, col. 1, lines 15 from top and 6 from bottom, for "*Alanda*" read "*Alauda.*" Page 159, col. 2, line 13, for "S. C." read "C. W." Page 183, col. 2, line 21 from bottom, for "Fig. 113" read "Fig. 115." Page 188, col. 1, line 16, for "*Cersis*" read "*Cercis.*" Page 211, col. 1, line 20 from bottom, for "as" read "and." Page 244, col. 2, line 24, for "(*C. thyoides*)" read "(*C. disticha*, Linn.)" Page 271, col. 1, line 3 from bottom, add a comma after "left." Page 276, col. 1, line 8 from bottom, for "*quinquemacalata*" read "*quinquemaculata;*" same page, col. 2. line 16 from bottom, for "Shaffer" read "Saffer." Page 302, col. 2, line 25 from bottom, for "in" read "and." Page 339, col. 1, line 22 from bottom, for "*Colandra*" read "*Calandra.*" On page 126, note, we referred all the drawings of Figure 85 to *Bruchus granarius:* in reality *a*, *e* and *f* only, represent that species, while *b*, *c*, *d* and *g* represent *Bruchus pisi.*

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WHY NOXIOUS INSECTS INCREASE UPON US.

It is an old and a very true remark, that the various insects that afflict the Gardener and the Fruit-grower are year by year becoming more numerous and more destructive. One principal reason for this result is sufficiently obvious. The continual tendency of modern improvement is to concentrate vegetable gardens and fruit farms in certain peculiarly favorable localities, instead of scattering them evenly and uniformly over the whole country. Hence every injurious insect that troubles the Gardener and the Fruit-grower has an abundant supply of such vegetation, as forms a suitable nidus for its future offspring, close at hand, instead of having to search for it with much labor over an extensive surface of country. Such insects are therefore enabled by this means to increase and multiply with greater ease and greater rapidity. Upon precisely the same principle, if you scatter over the surface of a whole county the amount of shelled corn that is just sufficient to feed a certain gang of hogs, and compel them to seek it out and pick it up every day of the year, they will not thrive so well nor multiply so fast, as if you feed out the very same amount of corn to them in a ten-acre lot, day after day for a whole year.

To a gentleman in Arkansas, who had expressed the opinion that that State was the best in the Union for the peach and the grape, and that Illinois was not naturally adapted to the culture of fruit, Dr. E. S. Hull recently replied in the following masterly manner. We copy from the *Journal of Agriculture* for August 14, 1869:

SIR—Your confidence in the superior adaptability of your soil and climate will probably not be maintained after a few years' experience. Just in proportion as you increase improved fruits, just in that proportion will fruit insects and fruit and fruit tree diseases increase with you. A recognition of this fact will each year, as you multiply your orchards, become more and more apparent. Your Hale's Early peaches, at first, will be free from rot, your pear trees measurably exempt from pear tree blight, your vines free from vine hoppers, the grapes free from grape codlings and rot, etc., etc. From some cause, not yet well understood, all or nearly all young vineyards are for the first few years of fruitage, free from rot, and then ever afterwards subject to it. The same is true of cherry, peach, and plum rot. Therefore to those engaging in horticultural pursuits, a knowledge of the several difficulties likely to be encountered should be recognized, and so far as known the remedies for each difficulty must be promptly applied.

In this State, or in certain portions of it, many persons believe that horticulture is undergoing a great revolution, and ultimately that the business will be mainly in the hands only of the well-informed — those who understand and promptly apply the proper means. In view of known facts and observations, made during the past twenty-three years in this part of the West, and further South, I am convinced that all sections alike must recognize as facts these statements:

Here the matter seems to have dropped. Nobody has thought of accusing Dr. Hull of being an atheist and a blasphemer, because he has said that the more you multiply your orchards, and the more you increase improved fruits, the more will bugs and other kinds of destructive organisms multiply and increase upon you. Nobody, in fact, has even gone so far as to insinuate that, simply because he has written the letter which we have printed above, he leans towards Socinianism, or Arianism, or Erastianism, or any of the other fine shades of *ism*, whereby heterodoxy (whatever that may be) differs from orthodoxy.

Now, mark how one man is allowed to steal a horse with impunity, and another man may not even look over the hedge without being thrown into jail for it. Henry Ward Beecher, in one of his contributions to the *Ledger*, recently expressed the following sentiments; and turn them which way you will, they merely

amount to the very same doctrine recently promulgated by Dr. Hull, and—we are almost afraid now to avow it—firmly believed in by ourselves; namely, that the larger the masses may be in which you grow any crop, the more will destructive organisms prey upon it:

The only way to exterminate the Canada thistle is to plant it for a crop, and propose to make money out of it. Then worms will gnaw it, bugs will bite it, beetles will bore it, aphides will suck it, birds will peck it, heat will scorch it, rains will drown it, and mildew and blight will cover it.

But does Henry Ward Beecher, after publishing such shocking sentiments, escape with as much impunity as his more fortunate compeer, Dr. E. S. Hull, of Alton, Ills.? Quite the contrary! Forthwith a writer in the *Christian Intelligencer*, signing himself "Puritan," is down upon the reverend gentleman like a thunderbolt, accusing the poor man of "veiled profanity," and arguing the question in the following lucid and certainly most original manner:

These bugs, beetles, aphides, heat, rain, and mildew, are the messengers of God. If they are sent—they *are on an errand for God!* Now, if the above extract has a point, it is that when mankind plant a crop of any kind of grain or seed, *God takes a malicious pleasure in defeating such schemes.*

Excellent! Most admirable logician! But why not attack the Illinois layman as well as the New York clergyman? "Just in proportion," says Dr. Hull, "as you increase improved fruits and multiply your orchards, just in that proportion will fruit insects and fruit and fruit-tree diseases increase with you." What is that but saying, that when mankind try to grow large quantities of extra fine fruit, "*God takes a malicious pleasure in defeating such schemes?*" At him, "Puritan!" Seize him by the throat and worry him to death! The Illinois State Horticulturist is clearly guilty of the most abominable "veiled profanity."

But it seems that "circumstances alter cases," and "the case being altered alters the case," and to parody the language of Shakspeare—

> What in the layman's scientific truth
> That in the parson is rank blasphemy.

For up to this day, though we always read the *Christian Intelligencer* and all the other religious newspapers with the most commendable perseverance, we have not noticed any attack in any of their columns upon the Alton philosopher—whether from the pen of "Puritan" or of any other anonymous scribbler—such as that which has been recently hurled upon the devoted head of Henry Ward Beecher.

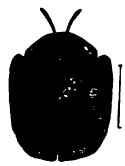
That our readers may not suppose that Mr. Beecher is unable to fight his own theological battles and has hired us, in default of a better ally, to defend him against the murderous thrusts of "Puritan," we shall close this article by quoting his most conclusive and logical reply to this most absurd and irrational attack:

This is exquisite! If mildew attacks my grapevine, it *is on an errand for God*, and if I sprinkle it with sulphur as a remedy, I put brimstone into the very face of God's messenger! When it *rains*—is not rain, too, God's messenger?—does "Puritan" dare to open a blasphemous umbrella, and push it up in the very face of this divine messenger? When a child is attacked by one of "God's messengers"—measles, canker-rash, dysentery, scarlet fever—would it be a very great sin to send for a doctor on purpose that he might resist these divine messengers? There are insects which attack man, against one of which we set up combs, and against another sulphur. "Nay," says "Puritan." "If they are sent, *they are on an errand for God*," and it is profanity to have recourse to fine tooth combs and sulphurous ointments in order to defeat the expressed will of God.

TORTOISE-BEETLES.

"Tortoise-beetles!" the reader will perhaps exclaim, "Why, this picture that you give us in the margin is not a beetle at all, but a true veritable mud-turtle! Beetles, as you have told us time and again, have got *six* legs, and this fellow has got only *four*, two on each side of his body, which, as with other mud-turtles, are evidently used as swimming-paws." Nevertheless, kind reader, this is a true beetle, and if you were to turn him upside down, you would see that he has got, on the lower surface of his flattened body, six very distinct pale-colored legs, though they are so short that they scarcely project when stretched out at full length beyond the thin crust which, as with a mud-turtle, projects from his body all round him. What you take for swimming-paws are not paws at all, but mere patches of dark opaque color on the thin projecting semi-transparent shell. If you refer to the drawing which we gave in our last number of the Mottled Tortoise-beetle (Fig. 179), you will see that that species has two such patches of dark color, representing the front swimming-paws, while those which represent the hind paws are entirely absent. Nor is this a mere fortuitous circumstance, dependent upon variation and what gardeners call "sports." You may take a thousand specimens of either species, and you will find that our species, which is termed the Clubbed Tortoise-beetle (*Deloyala clavata*, Oliv.), always seems to have

[Fig. 1.]



Colors—Brown-black and yellowish.

four paws, while the Mottled Tortoise-beetle always confines himself to two. And what is very remarkable, there is a species found in Hindostan which is marked almost exactly like our insect.*

Of course, in such a case as this, the resemblance must be purely fortuitous; for the discrepancy in size is so enormously great, that it is impossible to believe that any, even the stupidest animal, could mistake this Tortoise-beetle for a real tortoise. In several other cases, however, of entomological mimicry, where a nest-building insect and its parasite have a strong general resemblance, it has been supposed by authors that this is a beautiful provision of nature, in order to enable the parasite to penetrate without danger into the nest of the other insect, and deposit its eggs there without interruption on the part of the nest-builder. It is contended, in fact, that, from the great resemblance between the two, the nest-builder mistakes the parasite for an individual belonging to its own species. So far as regards social insects, such as Yellow Jackets and Humble-bees, this theory will do very well; for as there are here a great number of individuals owning a nest in common, it is reasonable to suppose that a parasite, that strongly resembled the members of the community, might occasionally slip in unobserved by any one of them. But with solitary nest-building insects the case is very different. Here there is but a single individual—the female—that constructs the nest, the male taking no part whatever in this process; and even if she mistook the parasite for an individual belonging to her own species, she would be just as unwilling for the stranger to enter her own private and peculiar nest, as a hen robin would be for another hen robin to make herself at home in the nest which she has herself labored to construct. Indeed, the number of parasites that resemble the insects upon which they are parasitic is so exceedingly small —certainly not exceeding the one hundredth part of the whole number of parasites—that here we are compelled, as in the case of our tortoise-beetle, to attribute the seeming mimicry to chance.

There are, however, very numerous instances of mimicry among insects, where the mimicker gains a manifest advantage by wearing the livery of some other organism, and where consequently the imitation must be attributed, not to chance, but to design. Such are those well-known cases among the span-worms or measuring-worms, where the larva is of the same dingy brown color as the twig upon which it rests, and where it habitually stretches itself out in a straight line at angles with the twig, remaining all the time perfectly stiff and immovable, so that even the acute eyes of the practised entomologist are sometimes deceived by the manœuvre, and mistake the living and breathing worm for a bit of dead and dry stick. Such also is the case of the Stick-bug, otherwise known as "Walking-stick," which we referred to on page 58 of our First Volume, and which has the singular habit of projecting forwards its two front legs and its antennæ all in a straight line, so that the whole insect, remaining immovable in this posture, looks like a straight stick, as represented in the middle of the right hand margin of the cover to our Magazine. Such again are those other cases, where insects, for instance our common Catydid, habitually living among green leaves, imitate those leaves, not only in the general coloring of their bodies, but in the very shape and even in the style of veining of their wings. The very peculiar and remarkable case of the Imitative Butterflies, we have already treated of in a separate article.*

Unlike the four or five species of Tortoise-beetles, which we figured and described in our recent article on the Insects infesting the Sweet Potato, the Clubbed Tortoise-beetle (Fig. 1) infests, not the Sweet, but the common Irish Potato. In the West it is rather a rare insect; for in the course of twelve years' collecting we have only met with some half dozen specimens, and we are entirely unacquainted with the larva. Mr. J. B. Hartwell, however, of Wilkinsonville, Massachusetts, frequently finds the perfect beetle feeding on the leaves of Potatoes and Tomatoes, though not in sufficient numbers to be seriously injurious; and Mr. Blanchard, of the same State, meets with it quite commonly both on the cultivated Potato and on the Bitter-sweet, a weed belonging to the same genus (*Solanum*) as the Potato. Moreover, Isaac Hicks, of Long Island, N. Y., has transmitted to us no less than twenty-six specimens, all found upon potato-stalks in his neighborhood. Thus, as the Tortoise-beetles previously figured by us mostly infest plants belonging to the *Convolvulus* Family, such as Sweet Potato and Morning Glory, the species that we have now to do with seems to be confined to plants belonging to the closely allied *Solanum* Family, such as the Potato, the Bitter-sweet and the Tomato. It is remarkable that the East Indian

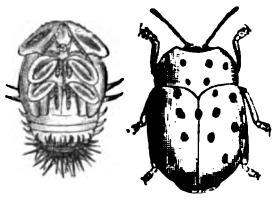
*Westw. *Introd.*, I, p. 379 and p. 377, Fig. 12.

*Amer. Entomologist, Vol. I, pp. 189-193.

species, just now referred to as being almost the exact counterpart in coloring of our Clubbed Tortoise-beetle, occurred in the Botanic Garden at Calcutta upon a convolvulus; but to what genus this insect belongs, authors do not inform us.

The larvæ of all the Tortoise-beetles, belonging to the genera with the body greatly flattened (*Cassida* and *Coptocycla*), always have the prickles that project from their bodies sprangled or barbed, as will be remarked from our figures 174, 177, 179 and 180. In the genus (*Chelymorpha*), to which belongs a brick-red insect with black spots (*Ch. cribraria*, Fabr., Fig. 2 *a*, pupa; *b* beetle) found upon Milkweed (*Asclepias*), and which has the body greatly rounded above with scarcely any lateral flange, the larva, as observed by Dr. Packard, has the prickles smooth and not sprangling. In the genus *Physonota*, to which belongs a new species figured herewith, the Five-dotted Tortoise-beetle (*Ph. quinquepunctata*, n. sp., Fig. 3, *b*), and which is intermediate in form between the last named genus (*Chelymorpha*), and those with the body greatly flattened (*Cassida*, *Coptocycla*, *Deloyala*), the prickles of the larva are also smooth, as may be seen by referring to Figure 3 *a*. Thus it results that structural differences in the perfect beetle are accompanied by corresponding structural differences in the larva.*

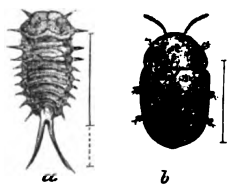
[Fig. 2.]



a *b*

Colors—(*b*) brick-red and black.

[Fig. 3.]



a *b*

Colors—(*b*) greenish-yellow.

As a general rule, to which as usual there are several exceptions, it is also the case that structural differences in this group of plant-feeding insects are accompanied by structural differences in the groups of plants upon which they ordinarily occur. We have seen that certain genera (*Cassida* and *Coptocycla*) are peculiarly attached to the *Convolvulus* Family; that another genus (*Deloyala*) haunts the *Solanum* Family; and that a fourth genus (*Chelymorpha*) is generally found on Milkweed. The genus to which the Five-spotted Tortoise-beetle belongs (*Physonota*) seems to be confined to the botanical Family *Compositæ;* for although we have not been able to ascertain the food-plant of this particular species, we have observed the One-dotted Tortoise-beetle (*Physonota unipunctata*, Say), feeding in the larva state upon a Sow-thistle (*Sonchus*); and as the name denotes, the Sunflower Tortoise-beetle (*Phys. helianthi*, Randall), which we were assured by Dr. Le Conte in 1865 is rightfully referred to this genus must feed upon Sunflower (*Helianthus*).

In the second and third number of our first volume we gave an account of eleven distinct species of insects, including the Black Blister-beetle (*Lytta atrata*), that attack the potato. The Black-rat Blister-beetle (*Lytta murina*), which is frequently confounded with the Black Blister-Beetle, though the former appears early in July and the latter not till the middle of August and forepart of September, has since been received by us from Mr. Munger of Lone Cedar, Minnesota, with the statement that it nearly ruined some fields of potatoes there in the forepart of July. To this formidable list of eleven distinct kinds of Potato Bugs, we must now add the Clubbed Tortoise-beetle, which no doubt works upon the potato in the larva, as well as in the perfect beetle state, though there is as yet no direct evidence to that effect.

It thus turns out that there are no less than a dozen different kinds of Potato Bugs, differing from each other in size, in shape, in coloring, in habits, in the number of broods produced in a single year, in their geographical distribution, and what is of most practical importance, in the best and most available method of fighting them. And yet we can scarcely take up a paper, whether political or agricultural, without stumbling upon some paragraph informing us that "THE Potato Bug" is behaving thus and

* We annex the scientific description of the Five-dotted Tortoise-beetle. The genus was determined for us in 1865 by Dr. J. L. LeConte, according to Boheman's arrangement of the Family.

PHYSONOTA QUINQUEPUNCTATA, n. sp. Pale greenish yellow. *Head* with the basal half of the antennæ polished both above and below, and black above; the terminal half opaque and black both above and below. *Thorax* polished and glabrous, with three black spots behind the middle, equidistant from each other and from the hind thoracic angles; the middle spot often elongate and always more advanced than the other two. Before the middle black spot a double dark olive spot, composed of two trapezoidal spots transversely arranged and not unfrequently more or less confluent with each other. *Scutel* pale. *Elytra* sparsely and rather coarsely punctured, with all but the exterior margin of a more or less pale dull olive color, the olive-colored portion of each elytrum dotted with pale yellow and with a large pale yellow round spot always a little before the middle, the pale yellow dots and spots slightly raised and impunctate. *Thorax* beneath a little varied with black. *Venter*, except the tips of the joints, black. *Legs* with a more or less extensive abbreviated superior spot on the femora, and an exterior line on the tibiæ, black. Length 0.38—0.50 inch. Twenty specimens.

Might be readily confounded with *Ph. unipunctata*, Say, but differs, 1st. by the basal joint of the antennæ having no black spot below; 2d. by the greater number of spots on the thorax (5 instead of 1); 3d. by the scutel being pale, not dark; and 4th. by the disk of the elytra not being unicolored and uniformly punctured.

so in such and such a locality. The Editors might just as well tell us, by way of important and interesting news, that "THE man" was elected to the United States Senate from such and such a State, and that immediately upon his election he married "THE woman."

SCIENTIFIC NOMENCLATURE.

A correspondent from California, Mr. C. P. Faulkner, puts the following questions to us, the answers to which we propose to give in the following article, inasmuch as those answers cannot be comprised in any very limited compass, and will perhaps be interesting to many others of our readers:

1. How is it that the Striped Cucumber Bug is called "*Diabrotica vittata*" in the *Practical Entomologist*, and "*Galeruca vittata*" in Harris's *Injurious Insects?*
2. Should "*Lytta vittata*" be called "*Epicauta vittata?*"
3. Should "*Lytta cinerea*" be called "*Macrobasis Fabricii?*"
4. Should "*Lytta marginata*" be called "*Epicauta cinerea?*"

Every scientific name for every species, whether of animals or of plants, consists of two words either simple or compound, the first of which is the generic and the second the specific designation of the particular species treated of. In popular language the order of these two words is always reversed; for we say "White Oak," "Burr Oak," "Live Oak," etc., in Botany; and in Zoology "Cinnamon Bear," "Grizzly Bear," "Black Bear," etc., instead of "Oak White," etc., and "Bear Cinnamon," etc., as these same words would be arranged according to scientific rule. This is because scientific names are always Latin or what passes for Latin, and in Latin, as in French, the adjective usually follows instead of preceding the substantive. In English, on the contrary, the adjective must almost invariably come before the substantive to which it belongs.

Specific Names.

As regards the specific name, the general rule in science is, that when once given and established by a suitable published description it must not be changed, unless it is manifestly incorrect and ungrammatical, or unless the same name has previously been applied, by some other author, to some other species belonging to the same genus, or, technically speaking, when the name is "pre-occupied." For example, a very large number of our North American Insects received specific names a hundred years ago from Linnæus, and retain those very same names to the present day. The only disputable point here is, what is to be done when a species has been named and described by B in some work of scientific authenticity, and when the name given to this species by B has been universally received by the whole scientific world for ten, twenty, or perhaps even fifty years, provided it should subsequently be discovered by C that several years before B wrote and published, A gave to this very same species, in some obscure publication of perhaps of but little or no value, another and a very different name, along with some kind of brief description. According to what is known as the "Law of Priority," interpreted in its utmost rigor, A's name takes precedence of B's, and all the labels in all the Cabinets in Christendom have to be changed so far as regards this particular species. Why? Because it is held that A, who is supposed to have established a kind of scientific pre-emption to his new species, will be unjustly treated and dishonored, if his scientific name is not adopted, although perhaps the description upon which that name is based is so brief, obscure, incorrect and unsatisfactory, that it is very doubtful whether it really applies to B's species, which may have been described by B fully, clearly and correctly. And yet, in the majority of such cases as these, A is in his grave, and perhaps it would have been a positive benefit to science if he had never been born. So that the practical result is, that, for the sake of appeasing the indignant ghost of some obscure and long-forgotten naturalist of the last century, all the naturalists of the present day are to be inconvenienced, and a great deal of valuable time is to be expended in studying out mere scientific *phrases*, which time might be employed to much better advantage in studying out new scientific *facts*.

The popular reader can form no notion of what a nuisance this perpetual disinterment of old buried names has become in the scientific world, but by putting an analogous case in common life. Suppose a set of industrious antiquaries were to busy themselves in investigating the genealogies of all the leading business men in the United States, and were to prove by the most satisfactory documents from the different Heralds' Colleges in Europe, that Smith's correct name was Jones, and Thompson's proper appellation was Johnson, and Cook's real title was Taylor; and suppose it was the established law that all these unfortunate men had to give up their old names and take up with the new-fangled ones. What confusion there would then be between the old firms of Smith &

Thompson or Cook & Smith, and the new firms of Jones & Johnson, or Taylor & Jones? How everybody would be bothered and tormented, for no earthly purpose, except for the special gratification of the very learned antiquaries who, by toiling without pay or reward for a long series of years, and by covering themselves with the dust of all the libraries in Europe, had made these most valuable and important discoveries! It is just so in Science. This year an insect bears the specific name which it has borne for the last ten or twelve years. Next year some entomological archæologist, who knows a great deal more about books than about bugs, insists upon its receiving a new name, being an old name which he is of opinion was given to this same insect fifty years ago by some ancient author. Well, the obedient scientific world submits to his dictum—relabels its cabinets—and begins gradually to acquire the habit of addressing Mr. Smith as "Mr. Jones." But—lo and behold!—the very next year there comes a still more recondite antiquary, covered three inches deeper with learned dust than his predecessor, and insists upon it that this very same bug was named and described one hundred years ago by an old forgotten author, whose writings are now completely out of date! Alas for the poor helpless victims of the inexorable "Law of Priority!" Everybody has to adopt the newly-discovered name; and while nineteen naturalists out of every twenty curse these archæologists, in their hearts, as the greatest of all possible scientific nuisances, they yet laud them most vigorously in public, as ornaments of science and discoverers of the most important truths. But we have not yet arrived at the last scene in this scientific farce. After our two antiquaries have successively covered themselves with glory by rebaptizing twice over the very same insect, some ingenious person comes along who has access to some European Cabinet of Insects, in which original specimens of several of the species named by old authors are preserved. Upon carefully examining these specimens, he discovers that the two antiquaries are both of them mistaken, and that the two species described by the two old authors are quite different from that which has given rise to all this wilderness of assertions and argument. The result of course is, that we have to return to the original name, and all the cabinets in the world have for the third time to receive new labels. To recur once more to our homely illustration from popular life—we are first compelled to call Mr. Smith "Mr. Jones," and then just as we are getting used to calling him "Jones," we have to give up "Jones" and take perforce to "Thompson" or "Cook." And finally, after all this useless and wearisome chopping and changing, we have to return like a dog to his vomit and call Mr. Smith by his original appellation of "Smith."

Certain scientific associations and certain authors—Dr. Schaum for example—have endeavored to limit and restrict the above abuse of the "Law of Priority." For ourselves, we must confess that we agree with Dr. Schaum and the rest of that school; but at present the fashion tends in the contrary direction, and naturalists are now, many of them, as busily occupied in discovering new names as ladies are in inventing new bonnets, and perhaps with much the same benefits to the cause of science. To us, it appears that a single new fact about the habits of an insect, or a single new idea upon its correct position in the scale of classification, are of far more importance than the knowledge of what particular name it bore some fifty or a hundred years ago. Of course such inquiries as these last are to a certain extent interesting and instructive; and so it is just as well for us to know that New York was formerly called "New Amsterdam," and that London was known to the ancient Romans, not as London, but as "Londinium." Nobody, however, but a fool or a madman would try to persuade the modern Gothamites to call their great city "New Amsterdam," or the English cockneys to have their letters addressed to "Londinium," because these were the old original names. And yet what men of the world would never dream of doing, certain scientific men are busily engaged in doing every day. For unfortunately the entomological antiquaries are never satisfied with simply proving to their own satisfaction that certain species, now universally known by certain specific names, were known a long time ago under other names. But they will insist upon having the privilege of forcing these old-fashioned names down the throats of their neighbors, by virtue of this tremendous "Law of Priority."

To apply the above remarks to the third and fourth questions of our correspondent: About the middle of the last century a German author called Foerster, is thought to have named and described as the "Ash-gray Blister-beetle" (*cinerea*) the very same species of insects, which Fabricius several years afterwards named and described as the "Margined Blister-beetle" (*marginata*), and which was for a long series of subsequent years known in the scientific world exclusively by this latter specific name. As

both Harris and Fitch make use of this name, and it has thus become familiarized to the popular ear in America, we ourselves adopted it in our first volume (page 25). And thinking as we do of the necessity of not pushing the "Law of Priority" to its extremest point, we maintain that this name, the "Margined Blister-beetle," having been once firmly established and received in science, ought never to be changed. Of course, the ultra advocates of the "Law of Priority" will be of the contrary opinion; and this being a free country, everybody can think and act for himself. After all, it is a mere question of *words* and not of *things;* and even those that maintain such changes as these to be necessary will allow that they are an unmitigated nuisance.

On the whole, such scientific reconstructions strike us very much like those heraldic anomalies of the British aristocracy, according to which the man whom we read of in history as Danby, subsequently becomes Marquis Carmarthen, and finally Duke of Leeds. Or we may compare them to the ancient law of the Sandwich Islanders, that, on the death of every King of those islands, so many score words in their language should be radically changed, so that, instead of "bread" and "stone" for example, being called "whang" and "choch," they should, in commemoration of the deceased monarch, be forever thereafter known as "chum" and "fum."

If the reader adopts the views expressed by us above, "the Ash-gray Blister-beetle" (*cinerea*) is the correct specific name for the species which was designated by this appellation by Fabricius after Foerster published his work. If, however, the Margined Blister-beetle is to be rechristened as "the Ash-gray Blister-beetle," in accordance with the strict Law of Priority, then the specific name of "Ash-gray" (*cinerea*) is preoccupied, provided we refer both insects to the same genus. And in that event no new specific name can be more appropriate and in accordance with rule than *Fabricii*. We cannot understand, however, why both insects should not bear the same specific name (*cinerea*), provided they are referred to different and distinct genera, as is now generally done in purely scientific works.

In any case, if we are careful to add to the specific name the name of its author, there can practically be no confusion or mistake. Everybody, for example, will understand at once, that "*Lytta cinerea*, Foerster," means the Blister-beetle described under the name of *cinerea* by Foerster and "*Lytta cinerea*, Fabricius" means the very different Blister-beetle subsequently described under the very same name of *cinerea* by Fabricius.

Generic Names.

As a general rule, species may be considered as having a real existence in nature, and as creations which, however much they may become changed and modified in a long series of indefinite ages, are yet practically unchangeable within the very limited times to which the knowledge of the present generation extends. Take, for example, the magnificent group of Moths formerly comprised by Linnæus under his extensive genus *Attacus*, to which the *Polyphemus* Moth, figured on page 121 of our first volume, belongs. In the United States there are four species of this group commonly met with, besides two or three others which are more or less rare. Thousands of specimens of each of these four species pass annually through the hands of American Entomologists; and yet nobody ever met with a single specimen, which could not be referred at a glance to its appropriate species. With genera the case is very different. It will be allowed on all hands that a genus is not a definite and unchangeable creation—the same in the days of our grandfathers as it is now, and likely to remain the same till the days of our grandchildren. On the contrary, genera in the scientific world are in a constant state of fluctuation, two or three old genera being sometimes amalgamated together to form a new one, but the more usual tendency being for one old genus to be split up into several new ones. For instance, the four splendid Moths referred to above, which in the times of Linnæus and his immediate followers were all considered as belonging to the same genus, are now referred by almost all scientific entomologists to three distinct genera, and in the opinion of some few are divided among no less than four—or a genus for every single species. No doubt, in the great majority of cases, this subdivision of one old genus into several new ones is a benefit to science and a great practical convenience to the student. When, for example, an old genus contains a very great number of species—say fifty or a hundred—and we wish to ascertain whether a species that belongs to it has been already described, we then have to compare our species with no less than fifty or a hundred different descriptions before we can decide the question one way or the other. Whereas if this unwieldy old genus had been separated by well-marked characters into four or five new genera, each containing some twen-

ty-five or thirty species, we should manifestly then have a much smaller number of descriptions to refer to. It must be confessed, however, that in many instances small genera, containing but a very few species, are unnecessarily cut up into a number of new genera each containing but one or two species, while on the other hand large unwieldy genera are rendered still more unwieldy by amalgamating them with other large genera. Usually this latter process is had recourse to, because one or more species are discovered, which form a sort of transitional stage or intermediate grade between the two large genera. Such species are generally called "aberrant;" and probably, if all the species that ever existed in the world in all geological time were placed side by side, there would be no two genera in Nature, that would not then graduate into one another imperceptibly by such aberrant forms. In such a case as the above, therefore, instead of uniting two large genera, and thereby making the rich richer still, as by splitting up small genera the poor are made poorer still, the appropriate course seems to be indicated by Audubon and Bachman in the following passage:

In every department of Natural History, a species is occasionally found which forms the connecting link between two genera, rendering it doubtful under which genus it should properly be arranged. Under such circumstances, the Naturalist is obliged to ascertain, by careful examination, the various predominating characteristics, and finally place it under the genus to which it bears the closest affinity in all its details.—*History N. A. Quadrupeds*, Vol. II, page 215.

Up to a comparatively recent date, the general opinion has been that generic characters should be founded exclusively upon structural peculiarities, and that color is not a generic but a specific distinction. It is now, however, beginning to be recognized in science, that there are certain colors and colorational patterns peculiar to almost every genus, and which are therefore as truly generic characters as the minutiæ of structure usually employed for that purpose. Take, for example, a few of our largest and best known genera of Butterflies. We shall find that *Argynnis* is usually some shade of tawney-red with zigzag lines running across its wings in a very remarkable pattern; while *Hipparchia* and its allies are brown with eye-like spots transversing its wings near their tips; and *Colias* ranges from white through sulphur-yellow to orange, with the tips of its wings black and a small silvery spot in the middle of each wing below. It is on this account, as well as for other reasons, that we believe those authors to be in error, who have referred our N. A. *Cecropia* and *Promethea* moths and the Asiatic *Cynthia* moth to three distinct genera; for in all three may be found very nearly the same coloring and the same very peculiar colorational pattern.

To return to the questions asked by our correspondent: The old and very extensive genus *Lytta* has been very satisfactorily divided by Dr. Le Conte into a number of new genera, such as *Macrobasis*, *Pomphopœa*, etc. If we were writing a purely scientific Paper for the Proceedings of some learned Society, we should certainly name the insects specified by Mr. Faulkner as *Epicauta vittata*, Fabr., *Macrobasis cinerea*, Fabr., and *Epicauta marginata*, Fabr., instead of referring them all three to the old genus *Lytta*. But writing as we do for the popular eye, and endeavoring to simplify as much as possible that technical nomenclature, which in spite of all the sauce we can serve it up with is still so distasteful to many palates, we have preferred to follow Dr. Harris's example and use the more generally known generic appellation for all these three insects. For similar reasons, Harris called the Striped Cucumber Beetle *Galeruca vittata*, instead of *Diabrotica vittata*, *Galeruca* being the old genus, which included a great number of the less extensive modern genera, such as *Diabrotica*.

One word more and we have done with this somewhat dry subject. It should never be forgotten that scientific nomenclature is a means and not an end. It is necessary to be able to name with accuracy and precision each organized being, before we can record any knowledge that we may have acquired concerning it, or understand such knowledge when recorded by others. And as Law is said to be "the perfection of human reason," so Science may be perhaps sufficiently well characterized as the perfection of human accuracy. But to learn by rote the names of a great number of organisms, without any intention of applying what we have learned to any ulterior purpose, and without troubling our head one particle about the grand system upon which all scientific classification is based; is about as unprofitable a task as the human mind can be employed in.

☞ Should a number of the ENTOMOLOGIST, through whatever cause, fail to reach any of our subscribers, we will cheerfully send another one upon being informed of the fact.

ON THE PRESERVATION OF ENTOMOLOGICAL CABINETS.

BY JOHN L. LECONTE, M. D.

[From the American Naturalist for August, 1869.]

I have tried at various times many experiments for the preservation of collections of insects, but with such limited success that I did not think the results obtained worth publishing. For the sake of deterring others from pursuing these different lines of unsuccessful attempts, it would be useful, perhaps, to give a brief account of my failures before describing a process recently devised, which seems to be both simple and effective.

Corrosive sublimate and various preparations of arsenic have been recommended by several high authorities. The former, even when most diluted, will finally render the pin brittle by the amalgam developed; the latter, when used in a very weak alcoholic solution so as to leave no efflorescence on the specimens, will preserve them well, but it is troublesome to apply, as the insects must be thoroughly soaked with the fluid before being placed in the cabinet. Binarseniate of potassa being deliquescent, suggested itself to me as a material that might be applied in greater strength, and many years ago I prepared two boxes of specimens with it. They had a good appearance for some time, and have never been attacked, but eventually a considerable deposit or efflorescence came on the surface, so that the specimens required cleaning before they could be used for study.

Painting the interior of the boxes with arsenious acid was also only partially successful; I have seen, though not often, living larvæ of *Trogoderma* in boxes thus prepared.

Having thus failed in finding any satisfactory mineral poison I then tried the vegetable alkaloids.

I soaked specimens in moderately strong alcoholic solutions of strychnia and picrotoxia, dried them, and put them into pill boxes with *Trogoderma* larvæ. After some weeks the specimens were partly eaten, and the larvæ transformed into perfect insects.

The effects of benzine and carbolic acid are powerful, but only temporary. The former is preferable on account of its less disagreeable odor, and may be used by pouring about a teaspoonful in each box; it must be renewed every four or five months.

Packing the collection in chests painted with coal-tar has been also recommended, and would certainly be efficient, but troublesome, and renders the collection, practically, nearly useless for study, on account of the difficulty of access to the boxes. Surgical art has, however, given to us an instrument by which a poisonous liquid can be rapidly and most effectively applied to the entire surface of large numbers of specimens as they stand in the cabinet boxes, without the trouble of moving them. I refer to the *Atomizer*. Opinions may vary as to the nature of the liquid poison to be used, but after several trials I have found the following formula to be quite satisfactory; it produces no efflorescence, even on the most highly polished species, while the odor is quite strong, and persistent enough to destroy any larvæ or eggs that may be already in the box:

Saturated alcoholic solution of arsenious acid, eight fluid ounces; Strychnine, twelve grains; Crystallized carbolic acid, one drachm; Mineral naphtha (or heavy benzine) and strong alcohol, enough to make one quart.

I have not stated the quantity of naphtha, since there are some varieties of light petroleum in commerce which dissolve in alcohol only to a slight extent. These should not be used. The heavier oils which mix indefinitely with alcohol are the proper ones, and for the two pints of mixture ten to twelve fluid ounces of the naphtha will be sufficient.

Care should be taken to test the naphtha on a piece of paper. If it leaves a greasy stain which does not disappear after a few hours, it is not suitable for this purpose.

The best form of atomizer is the long, plated, reversible tube; it should be worked with a gum elastic pipe, having two bulbs to secure uniformity in the current. The atomizing glass tubes and the bottle which usually accompany the apparatus are unnecessary: a common narrow-necked two ounce bottle will serve perfectly to hold the fluid.

I trust that the use of the means here indicated may render the preservation of insect collections less troublesome than heretofore, and thus increase the interest of amateurs who frequently become disgusted with the science of entomology, by seeing the results of years of active and intelligent labor destroyed by a few months of inattention, or by carelessness in introducing infected specimens.

KILLING APPLE-WORMS BY MACHINERY.

The world certainly moves! Men are constantly making discoveries, which though trivial in themselves, greatly benefit their fellow-men. The hay-band remedy against the Apple-worm (*Carpocapsa pomonella*, Linn.) is an excellent one, but we are obliged to seek for the worms which spin up under it, and crush each one separately. Mr. D. N. Brown, an enterprising fruit-grower of St. Joseph, Mich., has however devised a plan of slaughtering them by wholesale, which commends itself to the good sense of every apple-grower. Here it is, as given in a late number of the St. Joseph *Herald*, by our friend and correspondent, L. P. Haskell of that place:

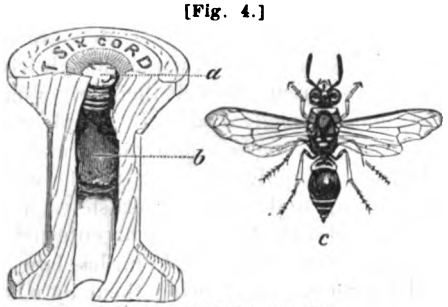
"Place early in June *rags*, not hay bands, in the forks of the tree, or trunk below the lower limb, and in these the larvæ will secrete themselves to enter the chrysalis state. Once in two weeks remove these rags, and destroy the insects. Mr. Brown does it very quickly and effectively by passing the rags through a clothes-wringer. In this manner he believes the nuisance may be got rid of; and yet the effort will be useless unless every owner of an orchard does the same thing. There must be *united* effort. Let every man feel it his duty to urge his neighbor to act at once and persistently, remembering that, 'eternal vigilance is the price of'—*good fruit*."

A POTTER-WASP.

(*Odynerus flavipes?* Fabr.)

In our article on "Wasps and their Habits," in Vol. I, No. 7, of the AMERICAN ENTOMOLOGIST, we showed how the various kinds of solitary Wasps provisioned their nests with different kinds of insects and spiders—how they first stung these little creatures so as to paralyze but not to kill them—and how the egg deposited by the mother-wasp, along with this living but dormant prey, subsequently hatched out into a soft defenseless larva, which fed at its ease upon the living provisions accumulated and stored up with such provident care by the author of its being. On page 138 we cursorily referred to the genus *Odynerus*—a very extensive group of the Solitary True Wasps, of which there are no less than ninety-nine described species found in North America. Several European species belonging to this genus are known to provision their nests with green lepidopterous larvæ, some of them excavating holes in sandy banks, some building their nests in the interstices of stone walls, and some selecting for that purpose wood that had been honey-combed by boring larvæ. We have a small North American species in our collection, which had made two nests in the central hole of a common wooden spool upon which cotton had been wound, closing up each end of the hole with tempered clay and separating one nest from the other by a partition of

[Fig. 4.]



Colors—(*c*) black and yellow.

the same material. (See Fig. 4, *a*, *b*.) For this specimen and the spool in which the nests had been constructed we are indebted to Miss Marion Hobart, of Port Byron, N. Ills. Quite recently we have received a much larger species, which we figure herewith (*Odynerus flavipes?* Fabr., Fig. 4, *c*), from Mr. E. Daggy, of Tuscola, Central Illinois, with the following account of its operations:

Enclosed I send you five small worms, one brown and four green ones. They came to my notice as follows: I was sitting in the sanctum of the *Journal* office this morning, and saw a yellow jacket or wasp deposit one of these worms in a hole in the top of a common black wooden ink-stand which was upon the table just before me. After the wasp had coiled it down nicely it left, and I of course examined to see what was done. I saw there were more than the single worm, so I left it, to await results. Presently the wasp returned, but not with a worm, and worked some little time with its head in the hole where the worms were. After it left, I noticed that the hole was sealed over with mud; presently it returned with still more mud, and thrice this operation was performed. On examining the contents of the hole in the ink-stand, I found, to my astonishment, thirty-five worms in it, doubtless the work of the same wasp. I send you five of these, wasp and all, as I have just captured it since I commenced writing to you.

It has been supposed by some entomologists that Wasps always provision the same nest with the same species of insect. But the five worms forwarded to us by Mr. Daggy, which averaged about one-third of an inch in length, although they were all the larvæ of small moths, mostly leaf-rollers, yet belonged to at least three distinct species. Along with them was sent a Wasp-larva which had attained maturity and already spun its cocoon, showing that there must have been more than one nest built by the mother wasp in the hole in the ink-stand, and that the tenant of the bottommost nest had already consumed its private and peculiar stock of larvæ and was preparing to lie up for the winter. In the cotton-spool, which was less than one and a half inches long, there were, as we have seen, no less than two distinct nests, although both ends of the central hole had to be filled up with clay to fit it for the purpose for which it was employed.

In the drawing which we have given above of this Potter Wasp (Fig. 4 *c*), the wings are represented as fully expanded. In repose, however, they are always doubled over upon themselves in the singular manner shown in figure 96, page 123 of our First Volume. This is a remarkable peculiarity of the True Wasps (*Diplopteryga*), not to be met with in a single species of the Digger Wasps (*Fossores*), although these last have precisely the same general habits as the *Solitary* True Wasps, to which our species appertains. The habits of the *Social* True Wasps, such as the Yellow Jackets, the Bald-faced Hornet, etc., are entirely different from those of the Solitary True Wasps; and yet their wings are folded in repose in exactly the same manner.

☞ The publishers of those papers which advertise to club with ours, will please take notice of our change of subscription price.

TOMATO-WORMS NOT POISONOUS.

For some unaccountable cause there are certain of God's creatures, that everybody seems to take a pleasure in vilifying and slandering, while on the other hand there are others that are almost worshiped in the popular mind. For instance, Toads and Snakes are considered by most persons as all of them equally poisonous and dangerous; whereas in reality the number of venomous snakes to be found in the United States may be counted on the fingers of one hand; and as to Toads, they may be freely handled with the most perfect impunity, and they prove themselves to be one of the very best friends to the gardener and the farmer by preying to a great extent upon noxious insects. On the other hand our small birds are considered *by many* as a kind of Sacred Animal, that it would be as impious for us to shoot when they are destroying our grapes and our cherries, as it would be for a Hindoo to drive away the holy Brachman Bull when that Bull is devouring his rice-crop before his very eyes. Among our insect friends, however, we find but very few that are popular favorites, the only instance that occurs to us at present being that of the Lady-birds (*Coccinella* family), which are the children's pets all over Europe, and are known in France as "the Virgin's Cattle," and "God's Cows." With this exception, perhaps, all other insects are commonly devoted to destruction as ugly and hateful abominations, which it is dangerous to touch and ridiculous to admire. More especially are the different kinds of Caterpillars, or "worms" as they are often called, which are the larvæ of our multifarious species of Butterflies and Moths, objects of the most unmitigated disgust. And perhaps of all these none is in worse repute than the common Tomato-worm.

This larva belongs to an extensive group (the *Sphinx* Family), almost all of which have a stiff pointed horn growing out of their tails—a merely ornamental appendage, such as those which are distributed in considerable numbers over the body of the magnificent larva, which we illustrated in the Frontispiece to our first volume. Why or wherefore it is impossible to say, but this poor unfortunate Tomato-worm has been selected by the popular voice, out of about fifty others belonging to the same Family and found within the limits of the United States—all of which have a similar horn growing out of their tails—to be falsely accused of using this horn as a sting. The Tomato-worm and the Tobacco-worm are as like as two peas, and produce moths which resemble each other so closely, that entomologists for a long time confounded them together. Each has exactly the same kind of horn growing on the hinder extremity of its body; yet while the Tomato-worm is generally accused of stinging folks with this horn, nobody, so far as we are aware, ever yet said that the Tobacco-worm would or could do so. The real truth of the matter is that neither of them can sting, either with its tail, or with its head, or with any part of its body. Yet not a season elapses but the newspapers publish horrible accounts of people being stung to death by Tomato-worms, and earnestly recommend those that gather tomatoes to wear heavy buckskin gloves. These stories, however, have been contradicted so flatly and so often, that latterly the penny-a-liners have struck off upon another tack. Tomato-worms, it appears, do not sting with the horn that grows on their tails, but they "eject with great violence a green caustic fluid from their mouths to a distance of from three to fifteen inches"!! Now what is the real truth about this matter? Tomato-worms do really discharge from their mouths, when roughly handled, a greenish fluid, and so do the larvæ of almost all moths, and so does every species of grasshopper with which we are acquainted, and so do many different kinds of beetles. But it is not true that they can spit out this fluid even to the distance of a quarter of an inch, much less to the distance of fifteen or even of three inches; and especially it is not true that the fluid is poisonous. If it were so, we should have been in our graves long ago; for we have had it repeatedly daubed over our fingers, but without the least ill effects therefrom, and so have scores of other entomologists in this country. The strangest thing of all is, that of two worms almost exactly alike, one of which eats tomato leaves, and the other eats tobacco leaves, the tomato-chewer should be accused of spitting, and the tobacco-chewer should be held to be guiltless of this offensive practice.

Now then, Gentlemen of the Public Press, if Tomato-worms neither sting nor spit, what is the next charge that you are going to bring against them? Why not assert that they can leap a distance of from ten to twenty feet, having taken deadly aim at the human eyes, which they forthwith proceed to gouge out with their rough rasp-like pro-legs? Of course you would follow this up by recommending everybody never to go near a tomato patch, without a large pair of green goggles to protect the eyes from being destroyed.

GOOSEBERRY AND CURRANT WORMS.

We candidly confess that we are discouraged. Nearly a year ago we published a full account of the different Potato Bugs to be found in the United States, showing that there are about a round dozen of perfectly distinct species attacking the Potato plant—some burrowing in the stalk, but most of them devouring the leaves—some infesting the plant both in the larva and in the perfect state, others in the perfect state exclusively—and most of them to be found all over the Union, while one of them is almost entirely confined to the Eastern States, and another is at present only to be met with in the West, though it is gradually advancing with giant strides towards the devoted East. In that article we further pointed out the practically very important fact, that different Potato Bugs having different habits must be attacked in different modes; and that what is excellent sauce for the goose will often turn out to be very poor sauce indeed for the gander. Yet—wonderful to relate!—in spite of all our efforts to disseminate correct knowledge on this subject, several newspapers have continued to publish paragraphs through the summer of 1869, showing how "THE Potato Bug" has done thus and so in such and such a neighborhood! They might just as well publish as interesting and satisfactory news, that "THE sheep" took the first premium at such and such a Wool-growers' Convention, or that "THE horse" won the race at the last meeting of the Honorable Jockey Club of Swindleton.

What then, under the circumstances, are we to do? Shall we give up in despair and discontinue the ENTOMOLOGIST, simply because it is demonstrated by hard dry facts, that such a paper is urgently needed, and that the popular ignorance on the subject of insects urgently requires to be enlightened? Far from us be such faint-heartedness! We acknowledge that we find a great many very "hard cases" among our adult population—men who maintain stoutly, that it is beneath the dignity of the human species to pay any attention to these infinitesimally minute little creatures, which are every day picking our pockets of untold millions of dollars. But we have great faith in the rising generation. School Superintendents are now beginning to recognize the fact, that Natural History is not only a very pleasing, but practically a most important study; and that as insects outnumber tenfold all the other animals in the world put together, so they annually inflict upon us ten times as much pecuniary damage as all the other animals in the world put together. Hence the very legitimate inference is drawn, that of all the various departments of Natural History, Entomology, viewed in the light of dollars and cents, is of the greatest practical importance; and but for the want of competent teachers and suitable text books, it would no doubt be introduced at once, as a regular branch of study, into all our best schools. We would suggest, however, to those who have such matters under their official charge, that where there is a demand there will always sooner or later be a supply; and that the very best way to create a demand for good Entomological Text-books, suited to the comprehension of children, is to disseminate among children a taste for the more pleasing and popular branches of Entomology. It is for the express purpose of creating such a taste in the public mind, that our Magazine has been set on foot; and in spite of our well-known modesty, we cannot help throwing out a hint here, that worse text-books than the AMERICAN ENTOMOLOGIST might on a diligent search be found in some of our public schools. But we must stop here. The publisher gravely admonishes us, that if our little work were generally introduced into all our Public Schools, or even into all our High Schools, it would be utterly impossible for him, with his present typographical facilities, to supply the demand for it. Such an idea, if practically carried out, would certainly ruin him; for he would then have to purchase, at a vast expense, one of the Patent Forty-Cylinder Printing-presses, that throw off 1,539,141 impressions every five minutes.

We have determined, therefore, upon a cool consideration of the state of the case, not to be daunted or discouraged, because a few benighted individuals will still persist in talking about "THE Potato Bug," instead of telling us in so many words whether they mean the Colorado Potato Bug, or the Ash-gray Blister-beetle, or the Three-lined Leaf-beetle, or whatever the particular species of Potato Bug may be that is destroying their potato-vines. We have thrown our bread upon the waters; we hope and believe that, after many days, or at all events after many years, it will be found and appreciated by the world. In the meantime, with unflagging resolution and unabated confidence, we shall proceed with our task. We have already given a complete history, illustrated by figures, of the different bugs that afflict the Irish Potato. We have done the same thing

with those that infest the Sweet Potato. We have commenced a series of articles, throwing light upon the multifarious species that destroy the health and vigor of the Grape-vine. In the present Paper we propose to give the Natural History of three perfectly distinct kinds of worms, or larvæ as they would be more properly termed, that devour the foliage of the Currant and the Gooseberry. There are other larvæ that bore into the stems or twigs of one or both of these plants, and should rather be called "Borers" than "Worms;" but with these we have at present nothing to do. In a future Paper we shall perhaps treat of these last by themselves.

The Currant and the Gooseberry, although the general appearance of the two plants is very different, and although almost all the species of Gooseberry are thorny and bear each fruit upon a separate stem, while all the species of Currant are devoid of thorns and bear their fruit in a peculiar kind of bunch technically known as a "raceme," are yet referred by Botanists to the same genus (*Ribes*). Our common Garden Gooseberry (*Ribes grossularia*) has been introduced among us from Europe; but we have four wild species commonly found in the Northern States; and besides these four there is a Californian species, the Showy Gooseberry (*R. speciosum*), which is sometimes cultivated as an ornamental plant in our gardens, for the sake of its fine deep-red hanging flowers and red stamens. On the contrary, our common Garden Red Currant (*R. rubrum*), of which the White Currant is a mere variety, is indigenous in the more northerly of the Northern States from New Hampshire to Wisconsin, although it is also a native of Europe; while on the other hand the Black Currant of our gardens (*R. nigrum*) is a European plant, and is thought by the best authors to be distinct from our American Wild Black Currant (*R. floridum*). Besides the above we have three other Currants peculiar to America. One of these, the Missouri or Buffalo Currant (*R. aureum*), grows wild in the Far West and is often cultivated in gardens, where its small, bright-yellow, spicy-scented flowers are very conspicuous in the early spring. Another of them, peculiar to Oregon and California, the Red-flowered Currant (*R. sanguineum*), is also occasionally grown as an ornamental plant on this side of the Rocky Mountains.

We have entered into these botanical details, because it is a remarkable fact that the three different Currant and Gooseberry Worms, now to be brought under our notice, all of them attack almost indiscriminately in our gardens the Red Currant and the Gooseberry, while they are none of them ever found upon our cultivated Black Currant or, so far as is known, upon our wild Black Currant. On the other hand our common imported Currant Borer (*Ægeria tipuliformis*) infests the Red or White Currant, but is never found in the twigs of the cultivated Black Currant or in those of the Gooseberry, whether wild or tame; while our wild Black Currant has a peculiar borer of its own (*Ægeria caudata*), belonging to the very same genus as the imported species which attacks the Red Currant; and we ourselves recently noticed, in the grounds of Mr. D. F. Kinney at Rock Island, Ill., that the tips of the rank vigorously growing twigs of the tame Black Currant were extensively bored on the last of June by that very general feeder the Stalk Worm (*Gortyna nitela*).* Finally, the common Currant Plant-louse (*Aphis ribis*)—a species introduced among us from Europe—may be noticed almost every spring in every patch of Red Currants, curling up the leaves in great numbers into blister-like elevations, on the inferior surface of which it resides; while neither this particular species of Plant-louse, nor any other species so far as we are aware, is ever met with either upon the Gooseberry, whether wild or tame, or upon the Black Currant, whether wild or tame. These facts may serve to show us how unsafe it is to infer that, because one insect can thrive upon a number of different species of a particular genus of plants, therefore another insect can do the same thing.

The Gooseberry Span-worm.

(*Ellopia* [*Abraxas*] *ribearia*, Fitch.)

This may be at once distinguished from any other worm, found either on Gooseberry or Currant, by its being what is popularly called a "measuring-worm" or span-worm. The annexed sketch (Fig. 5) shews this larva in three different positions, No. 1 representing it in profile in the looping attitude, and No. 2 giving a dorsal view of it as it hangs suspended by a thread. When full-grown it measures about an inch, and is of a bright yellow color, with lateral white lines and numerous black spots and round dots. The head is white, with two large black eye-like spots on the outer sides above and two smaller ones beneath. The six true legs are black and the four pro-legs yellow. It attains its growth about the middle of June, when it descends to the ground and either burrows a

* Figured with its larva in AMER. ENTOM. I. page 22, fig. 11.

little below the surface or hides under any rubbish that may be lying there; but in neither

[Fig. 5.]

Colors—(1 and 2) yellow, black and white; (3) mahogany brown.

case does it form any cocoon. Shortly after this it changes to a chrysalis (Fig. 5, No. 3), of the usual shape and shining mahogany brown color. After remaining in the pupa state about fourteen days, it bursts the pupa shell and in the forepart of July appears as a moth (Fig. 6), of a pale nankin yellow color, the wings shaded with faint dusky leaden-colored spots arranged so as not to present any definite pattern. The sexes then couple as usual, and the female lays her eggs on the branches and twigs of the bushes. Owing to this peculiarity, the species is frequently carried in the egg state upon transplanted bushes from one neighborhood to another; which accounts for its sudden appearance in parts where it was before unknown. For there is but one brood of this insect in one year, and the eggs must consequently, like those of the Tent-worm of the Apple-tree, be exposed, on the twigs and limbs to which they are attached, to all the heats of July and August without hatching out, and to all the frosts of December and January without freezing out. At length, when the proper time arrives, and the gooseberry and currant bushes are out in full leaf so as to afford plenty of food, the tiny but tough little egg hatches out about the latter end of May, and in a little more than three weeks the worms attain their full larval development.

[Fig. 6.]

Colors—Pale yellow and faint lead-color.

This Gooseberry Span-worm was first noticed near Chicago in 1862 or '63; and for two or three years afterwards it increased rapidly, so as in most gardens not to leave a single leaf on the gooseberry, and in many instances to entirely strip the currant bushes. It is quite common also in St. Louis and Jefferson counties in Missouri, and for the past two seasons has entirely stripped the Gooseberry bushes on many farms in these counties. Elsewhere in the Western States it is not by any means common; but in many localities in the East it has been a severe pest for a great number of years, especially in the States of New York and Pennsylvania. Near Rock Island, Ill., in the course of twelve years collecting, we only met with one solitary specimen of the moth, although there are plenty of wild gooseberries growing in the woods there, which plant was in all probability its original home, before the introduction into this country of the cultivated gooseberry. We have observed that the species shows a decided preference for the gooseberry, always attacking that plant first when growing side by side with the currant. Hence we have given it the English name of the "Gooseberry Span-worm," to distinguish it from the Imported Currant Worm next to be treated of, which conversely prefers the Currant to the Gooseberry. In reality, however, as we hinted before, the "Gooseberry Span-worm" frequently becomes a Currant Span-worm, and the "Imported Currant Worm" is often to be met with performing the part of an Imported Gooseberry Worm.

It should be carefully observed that the Gooseberry Span-worm is a native American insect, not to be found on the other side of the Atlantic. In Europe, indeed, there is an allied span-worm (*Abraxas grossulariata*), which infests their gooseberry and currant bushes much in the same way as our indigenous species infests our bushes; but the larva and especially the perfect moth are marked very differently.* We mention this fact, because it was erroneously stated four years ago in an Article in the *Prairie Farmer*, that the two were identical; and because, as we shall show in a future article, the truth is here of some considerable scientific interest and involves some very curious consequences.

*Figures of both will be found in Westw. *Introd.* II. p. 396, Figs. 1 and 3.

The Imported Currant-worm.

(*Nematus ventricosus*, Klug.)*

It is only about a dozen years since this most pernicious enemy to the Currant and Gooseberry was introduced from Europe into the United States. So far as can be ascertained, it made its first appearance among us in the neighborhood of Rochester, N. Y., and is supposed to have been imported along with some gooseberry bushes from Europe by the celebrated Rochester nurserymen, Messrs. Ellwanger & Barry. In nine years time, besides colonizing in other directions, it had gradually spread to Washington Co., N. Y., on the east side of the Hudson River—a total distance of about 225 miles. Thus, as it appears, it traveled at the average rate of some 25 miles a year, establishing a permanent colony wherever it went, and not passing through the country as a mere moveable column of invaders. In 1860 or '61 it appeared at Erie in the N. W. corner of Pennsylvania. In 1864 Prof. Winchell found it at Ann Arbor, Michigan. In 1866 it was generally distributed over the N. E. counties of Pennsylvania. And judging from a conversation which we had in October, 1868, with Mark Carley, of Champaign, in Central Illinois, this gentleman must have had it in great numbers upon his currant bushes in the summer of that year. At all events he described the worm which had infested his bushes as being green with many black spots and as not being a looper.

But besides the principal centre of distribution at Rochester, N. Y., this Currant-worm seems to have been imported from Europe at one or two other points in the Eastern States, and as at Rochester to have spread therefrom as from a focus. Unless our memory greatly deceives us, Mr. Geo. Brackett, of Maine, described this same insect many years ago, as existing in that State, though he gave it a different specific name, and was not at all aware that it had been introduced from the other side of the Atlantic. We also heard of it in the summer of 1867, from Mr. A. H. Mills, of Vermont, as being very destructive in his neighborhood. Not improbably, it was independently imported at other points in the East. Wherever it is introduced it spreads with great rapidity, and as there are two broods every year, it soon multiplies so as to strip all the currant and gooseberry bushes bare and utterly ruin the crop, besides eventually destroying the bushes, unless proper measures be taken to counteract it. Throughout the western parts of New York, as we have been informed by our ornithological friend Dr. Velie, the cultivation of currants and gooseberries has been almost entirely given up, on account of the depredations of this seemingly insignificant little savage. And, according to Dr. Fitch, at Watertown, N. Y., "it kept the bushes so destitute of leaves in most of the gardens, that in three years they were nearly or quite dead."

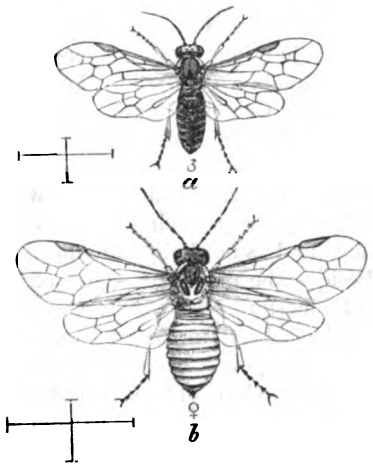
The Imported Currant-worm Fly (Fig. 7, *a* male, *b* female, both enlarged), belongs to the Sawflies (*Tenthredo* Family)—a group of the Order of Clear-winged Flies (*Hymenoptera*), which is remarkable for having most of its larvæ with the same plant-feeding propensities as those of the great bulk of the larvæ of the Moths, and with very much their general appearance. Sawfly larvæ, however, may be readily distinguished from moth larvæ, in the majority of cases, by having either 22, 20 or 18 legs; whereas the greatest number of legs that any moth larva has is 16. The species that we now have to do with

* In the PRACTICAL ENTOMOLOGIST for September, 1866, the Senior Editor published the first complete history of this Insect, as it exists in the United States, and in an Appendix to the Article gave its full scientific synonymy, showing that, in accordance with the Law of Priority, its correct name was *Nematus ventricosus*, Klug, and that, according to Snellen Von Vollenhoven, this was as early as 1859 the received name for the species in Europe. As is stated in that Article, the species was first described by Klug in the year 1819 under the above specific name, and it was not till four years afterwards that St. Fargeau blunderingly described the male under the specific name of *affinis*, and the female under the specific name of *trimaculatus*—thus manufacturing two species out of one! Two years after the above Paper from the pen of the Senior Editor had been published, Dr. Fitch gave to the world an Article on this subject in the *Transactions of the New York State Agricultural Society* for 1867, pp. 909--932 In this Article, though he incidentally remarks (p. 910) that the same insect had been described by another author under the name of *ventricosus*, he yet adopts St. Fargeau's name for it, or rather that one of St. Fargeau's two names which applies exclusively to the female sex—namely "*trimaculatus*." This, however, is a trifling matter; for although Dr. Fitch has frequently busied himself in upsetting old established names, and in accordance with the rigid Law of Priority supplanting those old names by still older ones, which he has chosen to resurrect from the buried dust of ages, we ourselves attach but little importance to this kind of scientific legerdemain. But Dr. Fitch has not been satisfied with adopting St. Fargeau's name published in 1823 in preference to Klug's name published in 1819, thus flying in the face of that very Law of Priority, for which he is generally so great a stickler: he must also adopt St. Fargeau's blunder in giving that name. It will scarcely be believed, but it is positively and absolutely true, that Dr. Fitch describes exclusively the female sex of this insect, and palms it off upon his readers as a description of both sexes! (See pp. 926-7). Yet the males are almost entirely black and the females almost entirely yellow; so that a description that suits the female is altogether inapplicable to the male. Nor is this an unusual thing among the Sawflies; for it was shown by the Senior Editor as long ago as December, 1866, that in this Family the body of the male is very generally much darker than that of the female, while in the *Ichneumon* family it is exactly the reverse. (See *Proc. Ent. Soc., Phil*, VI, pp. 238-9).

In the Paper in the *Practical Entomologist* which has been already referred to (Vol I, pp. 120-1) it is expressly stated that "the males and females of this Sawfly differ so widely that they would scarcely be taken by the inexperienced entomologist for the same species;" and a very full description of each sex is then and there given. Yet two years subsequently Dr. Fitch, as it appears, was totally unacquainted with the male sex, or at all events his description applies exclusively to the female, and he says not one single word about the sexes. And this when, by his own account, the insect was swarming in his own garden under his very nose! Of course, under these circumstances, it is impossible that he could ever have looked into the Paper on the same subject published two years before in the *Practical Entomologist*. But when an author is careless enough to make such blunders as the above, would he not do well, before he gives his own lucubrations to the world, to see what others have published in the same special department of Natural History?

comes out of the ground soon after the leaves of the currant and gooseberry bushes, upon which it feeds, put forth in the spring, or from

[Fig. 7.]



Colors—Black and yellow.

the latter part of April to the forepart of May. The sexes then couple, and the female proceeds to lay her eggs along the principal veins on the under side of the leaf. From these eggs shortly afterwards hatch out minute green 20-legged larvæ or worms, which at first have black heads and many black dots on their bodies, but after moulting for the last time are entirely of a grass-green color, except the large dark eye spots on each side of the head found in all larvæ belonging to this genus, and except that the joint next the head and the two hindmost joints are of a yellow color, as is also the case in the less mature larva, which bears so many black markings. In the annexed Figure 8, *a*, *a*, *a*, *a* shows larvæ of different sizes in different positions; and *b* gives

[Fig. 8.]

Colors—Green, yellow and black.

an enlarged view of one of the abdominal joints in profile, so as to exhibit the position of the black spots. When full-grown the larvæ are about three-quarters of an inch long, and from their greatly increased size, make their presence readily known by the sudden disappearance of the leaves from the infested bushes. Shortly afterwards, having attained a length of fully three-quarters of an inch, they burrow underground, generally beneath the infested bushes, or, if there are many leaves lying on the ground, simply hide under those leaves. In either case they spin around themselves a thin oval cocoon of brown silk, within which they assume the pupa state. But frequently, as we are assured by Mr. Saunders of Canada West, and as European observers have noticed, they spin their cocoons in the open air upon the bushes. About the last week in June or the first part of July, or occasionally not until the beginning of August, the winged insect bursts forth from the cocoon and emerges to the light of day; when the same process of coupling and laying eggs is repeated. The larvæ hatch out from this second laying of eggs as before, feed on the leaves as before, and spin their cocoons as before; but the perfect fly from this second brood does not come out of the cocoon till the following spring, when the same old series of phenomena is repeated.

From the drawings of the Male and Female Fly given above (Fig. 7), the reader will see at once that the two sexes differ very widely. This is very generally the case among the Sawflies, and it is a remarkable and most suggestive fact that, when this takes place, the body of the male is almost invariably darker than that of the female. Nor does our species, as will be observed at the first glance, form any exception to the rule. Indeed, as with two other Sawflies that devour the foliage of our Pines and Firs (*Lophyrus Abbottii* and *L. abietis*), the body of the male is almost entirely black and that of the female almost entirely yellow; so that at first sight we should suppose the two to belong to different species. Since, from some unaccountable oversight, Dr. Fitch has overlooked this fact, and described both sexes as being colored in the manner which is exclusively to be met with in the female, it will be as well to add here full descriptions, first of the female fly and secondly of the male fly. These descriptions were, indeed, published by the Senior Editor two years before Dr. Fitch's appeared; but the writings of that gentleman circulate so extensively that, when he makes an important mistake such as this, it is proper that it should be corrected in our columns in detail.

FEMALE FLY.—General color of body bright honey-yellow. *Head* black, with all the parts between and below the origin of the antennæ, except the tip of the

mandibles, dull honey-yellow. Antennæ brown-black, often tinged with rufous above, except towards the base, and beneath entirely dull rufous except the two basal joints; four-fifths as long as the body, joint 3, when viewed laterally, four times as long as wide, joints 3-5 equal in length, 6-9 very slowly shorter and shorter. In two females the antennæ are 10-jointed, joint 10 slender and $\frac{2}{3}$ as long as 9. *Thorax* with the anterior lobe above, a wide stripe on the disk of each lateral lobe which is very rarely reduced to a mere dot, or very rarely the whole of each lateral lobe, a spot at the base and at the tip of the scutel, the two spots sometimes confluent and very rarely subobsolete, a small spot at the outer end of each cenchrus and a geminate small spot transversely arranged between the cenchri, the tip of the metathoracic scutel, the front and hind edge above of what seems the 1st abdominal joint, but is in reality the hind part of the metathorax, or very rarely its whole surface above, and also the whole lower surface of the breast between the front and middle legs, or very rarely two large spots arranged crossways on that surface, all black. Cenchri whitish. *Abdomen* with joints 1 and 2 very rarely edged at tip with black. Sheaths of the ovipositor tipped more or less with black, the surrounding parts sometimes more or less tinged with dusky. The triangular membrane at the base of the abdomen above, whitish. *Legs* bright honey-yellow; all the coxæ and trochanters whitish; the extreme tip of the hind shanks and the whole of the hind tarsi, brown-black. *Wings* glassy; veins and stigma brown-black, the latter as well as the costa obscurely marked with dull honey-yellow. In a single ♀ all three submarginal cross-veins are absent in one wing, and only the basal one is present in the other wing. In another ♀ all three are indistinctly present in one wing, and in the other only the basal one and a rudiment of the terminal one. In a single wing of two other ♀, the terminal submarginal cross-vein is absent. And in a single ♀ there are but three submarginal cells in either wing, precisely as in the genus *Euura*.—Length ♀ 0.22—0.28 inch. Front wing ♀ 0.27—0.33 inch. Expanse of wings ♀ 0.53—0.64 inch, (wings depressed).

MALE FLY.—General color of body black. *Head* with the clypeus and the entire mouth, except the tip of the mandibles, dull honey-yellow. Antennæ brown-black, often more or less tinged with rufous beneath except towards the base: as long as the body, the joints proportioned as in ♀, but the whole antenna, as usual in this sex, vertically much more dilated, so that joint 3 is only $2\frac{1}{2}$ times as long as wide when viewed in profile. *Thorax* with the wing-scales and the entire collare honey-yellow. Cenchri whitish. *Abdomen* with more or less of its sides, the extreme tip above, and its entire inferior surface honey-yellow. *Legs* as in ♀. *Wings* as in ♀. In two ♂ the middle submarginal cross-vein is absent in both wings, so that if captured at large they would naturally be referred to the genus *Euura*. In two other ♂ this is the case in one wing only. Another ♂ has but the basal submarginal cross-vein remaining in each wing. And in two other ♂ the terminal submarginal cross-vein is absent in one wing — Length ♂ 0.20—0.22 inch. Front wing ♂ 0.23—0.25 inch. Expanse of wings ♂ 0.44—0.51 inch, (wings depressed.)

Described from 22 ♂ and 13 ♀, 3 ♂ and 1 ♀ of the spring brood. The fact of two ♀, contrary to the established character of the genus *Nematus*, having 10-jointed instead of 9-jointed antennæ is a variation of a kind of which no other example in the whole Family of Sawflies is on record. Had such a specimen been captured at large, instead of being bred, along with a lot of normal ♀, from the same lot of larvæ taken from the same lot of bushes, it would probably have been made the basis for a new genus and a new species by some of our genus-grinding closet-entomologists.

The mode in which this Currant Worm has been transmitted, first from the European nursery to the American nursery, and afterwards all over several States of the Union, can be easily explained. As has been stated just now, it usually passes the autumn and winter in the ground under the bushes, where it has fed, housed in a little oval cocoon from $\frac{1}{4}$ to $\frac{1}{3}$ inch long. Hence if, as often happens, infested bushes are taken up in the autumn or early in the spring, with a little dirt adhering to their roots, and sent off to a distance, that dirt will likely enough inclose a cocoon or two. A single pair of cocoons, if they happen to contain individuals of opposite sexes, will be sufficient to start a new colony. The first and probably the second year the larvæ will not be noticed; but increasing, as almost all insects do, unless checked from some extraneous source, in a fearfully rapid geometric progression, by the third or fourth year they will swarm, strip the bushes completely bare of their leaves, and ruin the prospect for a good crop of fruit. Of course, like other winged insects, they can fly from garden to garden in search of a suitable spot whereon to deposit their eggs; so that any point where they have been once imported becomes, in a few years, a new centre of distribution for the immediate neighborhood.

Nurserymen and all others, importing Gooseberry and Currant bushes from a distance, should be particularly careful, before they plant them, *to wash the roots thoroughly in a tub of water, and burn or scald whatever comes off them.* Any cocoons, that may happen to be hidden among the dirt attached to the roots, will then be destroyed. By attending to this precaution the dissemination of this mischievous little pest, throughout the United States, may be greatly retarded for many years to come.

For those who are already cursed with it, the same hellebore which we shall recommend at the end of this Article, as universally efficient against all three kinds of Gooseberry and Currant Worms, is the best, the cheapest and the most available remedy. Where this cannot be conveniently obtained, the Imported Currant Worm, owing to a peculiarity in its habits, can be pretty successfully fought upon a system, which is inapplicable to the other two species on account of the difference in their habits. Unlike the other two, the Imported Currant Worm, as has been already stated, lays its eggs in large groups on the under side of the leaf, and upon the principal veins, as shown at No. 1 in Figure 9, instead of attaching them in comparatively small patches to the twigs and branches. Hence, when the eggs hatch out, the minute little larvæ can find

[Fig. 9.]

plenty of food without wandering off, and they have the habit when very young of boring small holes through the leaf as shown at No. 2 in Figure 9, and when they become a little older, holes that are a little larger as shown at No. 3. It is evident that such holes as these may be readily recognized, and the leaf be carried larvæ and all far away from any currant or gooseberry bushes and left to wither there, or—to make assurance doubly sure—thrown into the fire. If, however, the young larvæ are removed a few rods away from any plant belonging to the botanical genus *Ribes* (Currant and Gooseberry), they will be sure to die of starvation. For they cannot feed on anything else, any more than the common Locust-borer can live on an Apple-tree. As the eggs are laid in such large groups, there will be but a few leaves bearing these newly hatched larvæ to remove from every bush.

Wherever this Currant Worm has been introduced, there has prevailed from some cause or other a popular superstition, that the currants grown upon the infested bushes are poisonous. This is a mere delusion. They may be, and very probably are, unwholesome, just as any other fruit would be perhaps more or less unwholesome, if grown under such unnatural conditions as to seriously affect the health of the tree; but we have the authority of Dr. Fitch, himself a physician, for believing that the common notion on this subject is entirely erroneous.

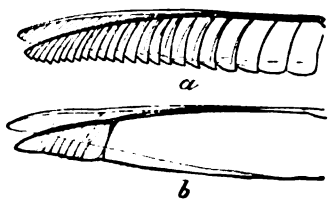
Entomologists have often speculated, whether the same parasite will attack several distinct species of insects, and whether any European species, which has been introduced into America without its peculiar parasites, will ever be attacked by the indigenous parasites of this country. So far as regards our Imported Currant Worm, both these questions can be answered in the affirmative. Three years ago the Senior Editor published the fact, that this worm was parasitically infested by the larva of a small Ichneumon-fly (*Brachypterus ? micropterus*, Say), which has such short and rudimentary wings, that it has very much the appearance of an Ant; and more recently it has been discovered by that excellent observer, J. A. Lintner of Schoharie, N. Y., that the eggs of this Currant Worm Fly are so generally inhabited by the larva of a minute Hymenopterous Parasite, that among fifty eggs he only found four or five which hatched out into Currant Worms.

As these pages were going through the press, we received from the Editor of the *Canadian Entomologist* a third parasite, which he had himself ascertained to prey, not on the egg of the imported Currant Worm Fly, but on the larva. This parasite is a small four-winged fly belonging to the great *Ichneumon* Family, and scarcely one-fifth of an inch long, with its front wings very prettily ornamented each of them with two dusky bands. A full description of it (under the name of *Hemiteles nativorus*, n. sp.) will probably appear before long, from the pen of the Senior Editor, in the columns of the excellent Periodical just now referred to. This very same species of *Ichneumon*-fly had been captured near Rock Island, Ill., several years ago by the Senior Editor; and as the Imported Currant Worm has not as yet been introduced into that region, we must conclude that this Ichneumon-fly could not have been imported into America from Europe along with this Currant Worm, but that in all probability it is an indigenous species. Hence we have additional proof that, under certain circumstances, native American parasites can, and actually do, acquire the habit of preying upon European insects when the latter are imported into America. It is certain, however, that they will not do so in all cases without exception; for although the Wheat Midge, or Red Weevil as it is incorrectly termed in the West, invaded our shores some forty or fifty years ago, not a single parasite has yet been discovered to prey upon it in this country, although there are no less than three that prey upon it in Europe.

The Sawfly Family (*Tenthredo*), to which both this and the next species to be noticed belong, derives its name from the "ovipositor" or egg-laying instrument being modified so as to mimick the blade of a saw. Under the microscope—and in the larger species even under a good lens—it will be seen that the lower edge of each of the two horny blades, of which this instrument is composed, is furnished with very

fine teeth, the shape of which differs in different species. With this tool the female fly saws into the texture of the leaf or of the twig, in which the instinct of each particular species teaches it to deposit its egg; and—wonderful to relate—it was demonstrated long ago that the eggs thus deposited inside the substance of the plant, which is to supply the future food to the young larva as soon as it hatches out, actually grow and derive nourishment from the sap of that plant, so as often to attain double their original size. Hence we may see at once why the eggs are deposited by this group of insects in such situations as these, and why Nature has provided the female Sawflies with saws in their tails. But—as the thoughtful reader will perhaps have already observed—our Currant Worm Fly lays its eggs upon the surface, and not in the interior, of the leaf, glueing them thereto by some adhesive fluid which it secretes for that purpose. And we may add that there are a few other Sawflies—such for example as the Rosebush Sawfly (*Selandria rosæ*)—which do the very same thing, and consequently, as well as our species, can have no use for any saws at their tails. If, therefore, as was formerly the almost universal belief of the scientific world, each species whether of animals or of plants was independently created, with all its present organs and instincts, and not derived, as is the more modern doctrine, from the gradual modification of pre-existing species through a long series of geological ages, we might naturally expect our Currant Worm Fly, and the Rosebush Sawfly and such few other Sawflies as practice similar modes of laying their eggs, to have no saws at all. For why should nature, when she is creating new species, bestow an instrument upon a particular species which has no occasion whatever to use that instrument? In point of fact, however, all female Sawflies, no matter what their habits may be, possess these saws, though in one genus (*Xyela*) the saws, instead of being hard and horny throughout, are said to be soft and membranous above and below;* and in certain other Sawflies, though they are as hard and horny as usual, they are degraded and—to use the technical term—"defunctionated." This will be seen at once from an inspection of the following drawing (Fig. 10) copied by ourselves from nature and very highly magnified. Here *a* represents the two saws of the female of the Willow-apple Sawfly (*Nematus salicis-pomum*, Walsh), which belongs to the very

[Fig. 10.]



same genus as our Currant Worm Fly. Now, we know that the female of the Willow-apple Sawfly deposits a single egg inside the leaf of the Heart-shaped Willow (*Salix cordata*) about the end of April, probably accompanying the egg by a drop of some peculiar poisonous fluid. Shortly afterwards there gradually develops from the wound a round fleshy gall, about half an inch in diameter, and with a cheek as smooth and as rosy as that of a miniature apple; inside which the larva hatches out and upon the flesh of which it feeds. Of this gall we propose to present a figure to our readers in the next number of our Magazine, in illustration of a Second Article on "Galls and their architects." In this particular case, therefore, as the female Fly requires a complete saw with which to cut into the Willow leaf, nature has supplied her with such saws, as is seen at once from Figure 10, *a*. Now look at Figure 10, *b*, which is an accurate representation under the microscope of the two saws of our Currant Worm Fly. It will be noticed at the very first glance, that although the blade of the saw is there, the teeth of the saw are almost entirely absent.

What, then, are we to make of these and many other such facts? Manifestly the teeth of the saw are in this last species degraded or reduced to almost nothing, because the female Fly, laying her eggs upon the surface of the leaf, and not cutting into the substance of that leaf as does the female of the Willow-apple Sawfly, has no occasion to perform any sawing process. But why, it will be asked, is the blade of the saw there in its normal size and, with the exception of the degradation of the saw-teeth, as completely developed as in the other species, when such a tool can not be necessary for the simple process of glueing an egg on to the surface of a leaf? The modern school of philosophers will reply, that this is so, because the primordial Sawfly, in the dim far-away vista of bygone geological ages, had a complete pair of saws, and our insect is the lineal descendant of that species, slowly and gradually modified through a long series of years, so as to conform more or less to the change in its habits. On the other

* See Westwood's *Introduction*, II, p. 95.

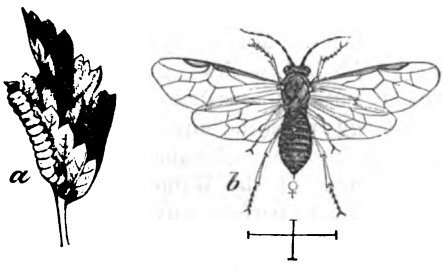
hand the old school of philosophers, who believe that every species was independently created, will argue that this is so, in order to "complete the System of Nature," and "carry out the Plan of the Creation," and "give full and free expression to the Thoughts of the Creator." Possibly this may be the true solution of the difficulty; but—and we say it in no irreverent spirit—what should we think of a Potter, who made all his teacups without exception with handles; those for which handles were required with complete ones such as you could put your finger through, and such cups as were not wanted to have any handles at all, with solid unperforated ones, such as would be nearly useless? And what should we say, if the Potter's friends were to gravely argue, that he took all this unnecessary trouble in order "to complete the System of Art," and "carry out the Plan of the Tea-drinker," and "give full and free expression to the Thoughts of the Potter"?

The Native Currant Worm.

(*Pristiphora grossulariæ*, Walsh.)

Like the Imported Currant Worm, this worm produces a Sawfly, which, however, belongs to a different genus (*Pristiphora*), chiefly distinguishable from the other one (*Nematus*) by the front wing lacking what is technically termed the "first submarginal cross-vein." In Figure 11, *b*, we give a magnified drawing of the female of this fly, and if the reader will look at this drawing and compare it with that of the Imported

[Fig. 11.]



Colors—(*a*) green and black; (*b*) black and honey-yellow.

Currant Worm Fly (Fig. 7, *a* and *b*), he will see that there is in each of them but one cell, or "pane" as it might be termed, on the upper edge of the front wing towards its tip. This is technically called "the marginal (or radial) cell." Now let the reader look a second time at these two figures, and he will see that, underneath this "marginal cell," there is a tier of four cells in the one genus (*Nematus*) and a tier of only three cells in the other genus (*Pristiphora*), the first or basal cross-vein being absent or "obsolete" in the latter, so as to leave the first or basal cell extravagantly large. These three or four cells, as they underlie the "marginal cell," are technically known as "the submarginal (or cubital) cells;" and upon the difference in the number and arrangement of these marginal and submarginal cells depends to a considerable extent the generic classification of the Sawflies. For example, in another genus (*Euura*), which is closely allied to the two of which we present drawings, there are, as in the second of these two, one marginal and three submarginal cells; but here it is the *second*, not the *first* (or basal) submarginal cross-vein that is obsolete; so that here it is the *second*, not the *first* (or basal) submarginal cell that is extravagantly large, being formed in this last case by throwing the typical second and third cells into one, and in the other case by throwing the typical first and second cells into one, just as by removing the folding doors two rooms are thrown into one.

Persons who are not familiar with this subject are apt to suppose, that the pattern of the curious network on every fly's wing varies indefinitely in different individuals belonging to the same species. As a general rule, there is scarcely any variation at all in this matter, each species and even each genus having its peculiar pattern, and all the individuals belonging to a particular species having the network of their wings as exactly similar as the different photographs executed by a Daguerreotypist from the same negative plate. You may take, for instance, a thousand honey-bees, and you will find that in the front wing of every one of them there are exactly one marginal and three submarginal cells, which however are all of them shaped very differently from the corresponding cells in any Sawfly, though all the thousand honey-bees will be found to have them shaped exactly alike, cell corresponding to cell, as in any particular issue of $5 Bank notes, vignette corresponds to vignette and medallion die to medallion die. Among the Sawflies, indeed, as was noticed in the description of the Imported Currant Worm Fly, the pattern of the wing-veins in different specimens of the same species varies occasionally a little; but this is the exception and not the rule, and is philosophically of high interest, as showing how one genus may in the course of indefinite ages change gradually into another genus.

The Native Currant Worm Fly differs in another remarkable point from the Imported Currant Worm Fly. The sexes are here almost exactly alike in their coloration, and with the exception of the legs of the male being a little

more marked with black than those of the female, it would not be very easy to distinguish one from the other, but by the usual sexual characters. Hence we have not thought it necessary to give a figure of the male as well as of the female; whereas in the imported species the two sexes differ so essentially in their coloration that, as already observed, a figure of one would give scarcely any idea of the other.

The larva of the Native Currant Worm Fly (Fig. 11, *a*) is of a uniform pale green color, without those black dottings which are always found except after the last moult in the imported species. Before the last moult, indeed, the head is of a uniform black color, though it afterwards has a good deal of green in front; but the body remains throughout of the same immaculate green shade. It differs also in its habits from the imported species, never, so far as we can find out, going underground to spin its cocoon, but always spinning that cocoon among the twigs and leaves of the bushes upon which it feeds.

This species agrees with the other one in being double-brooded, the first brood of larvæ appearing about the end of June and the beginning of July, and the second brood from the middle of August to the forepart of September. But instead of the larvæ of the second brood lying underground in their cocoons all winter, they burst forth in the fly state from the beginning to the middle of September. Hence the female fly is compelled to lay her eggs upon the twigs instead of on the leaves; for if she laid them upon the leaves, as is the habit of the imported species, the second laying of eggs, which has to pass the winter in that state, would fall to the ground along with the leaves in the autumn, and the young larvæ would starve when they hatched out next spring before they could find their appropriate food. Consequently, in the case of this species, we cannot apply the method of counterworking the other species which has been already referred to. For we have particularly remarked that the very young larvæ were not gathered in great numbers upon one particular leaf—as with the imported species—but were distributed pretty evenly over the whole bush. Neither did they bore the singular holes through the leaf (Fig. 9), which render the other species so easy of detection when young.

As will have been observed from the figures given above, the Native species, besides the differences already noticed, is only about two-thirds the size of the other in all its states. Like the other, it infests both Currant and Gooseberry bushes, but appears rather to prefer the Gooseberry. Indeed there can be little doubt that our native gooseberries formed its original food-plant; for many years ago we captured a single specimen in the neighborhood of Rock Island, Ill., in woods remote from houses, where the wild gooseberry was pretty abundant, and there was no wild Red Currant. The species was described in 1866 by the Senior Editor* from numerous specimens found stripping the gooseberry and currant bushes in Davenport, Iowa; and it has since been reported to us by Miss Marion Hobart, of Port Byron, N. Ills., as so abundant in her neighborhood in 1868 on the gooseberries as to completely defoliate them three times over, so that she inferred—but we think erroneously—that there were three distinct broods of them, one generated by another. Mr. Jas. H. Parsons, of Franklin, N. Y., has in a letter to us expressed the same opinion with regard to the imported species. Probably both parties have been deceived by what is a very common occurrence with many leaf-feeding larvæ. There is often a warm spell early in the year which causes a moiety of the eggs of a particular brood to hatch out. This is taken for the first brood. Then follows a long series of cold weather, which prevents the other moiety of the same batch of eggs from hatching out till perhaps a month or six weeks afterwards. When at last this moiety does hatch out, it is considered by inexperienced persons as a distinct second brood. There is also very frequently a very great variation, probably from similar causes, in the time at which the same batch of pupæ burst forth into the perfect winged state. For example, out of a lot of 31 cocoons of the second brood of the Imported Currant Fly, all received by us at the same time from Dr. Wm. M. Smith of Manlius, N. Y., most of the flies came out between June 26th and July 11th, but a few did not appear till towards the latter end of July and one lingered on till August 13th.

On Sept. 11th, 1869, we captured a single female of the Native American species at large in the City of Rock Island; but the species has not yet prevailed there to any noticeable extent, so far as we have heard. In August, 1867, A. H. Mills, of Vermont, wrote to us about "a small green worm" infesting the leaves of his Currant bushes, which, as he was well acquainted with the Imported species, was most probably the Native American worm. And as long ago as 1858, a species of Sawfly was described in the

* *Practical Entomologist*, I, pp. 122-4.

Ohio Farmer, by an anonymous correspondent, as infesting the gooseberry and red currant bushes in the vicinity of Cleveland, Ohio. This last species seems to agree in every material respect with our insect, except in going underground to spin up, and in the last brood lying underground in their cocoons all through the winter. Now, we particularly experimented with our species, by counting off a large number of larvæ and putting them into a separate vessel half full of earth; and we found subsequently just as many cocoons attached to the twigs in this vessel as we had put larvæ into the vessel. Hence, if the species ever goes underground to spin up—which is perfectly possible, as there is a similar variation in habits in the Imported Currant Worm—it must be only occasionally. Moreover, we raised fifty-three flies in all (4 ♂, 49 ♀), from larvæ which spun up the last week of August, and none of these flies came out later than Sept. 12th of the same year. Hence—unless the Ohio insect be a distinct species, which we can scarcely believe—we suspect some error in the statements put forth in the *Ohio Farmer*.*

Remedies.

In the case of the multifarious species of Potato Bugs, we showed that different groups must be attacked upon different systems. In the case of the three Currant and Gooseberry worms, that we have here treated of, there is a single remedy which, like Dr. Cureall's Never-failing Pills, is a universal specific. That remedy is powdered White Hellebore, which can be bought at any drug-store at quite a low price. All that is required is to dust it lightly over the infested bushes, taking care to stand to windward during the operation, as if taken into the nostrils it excites violent sneezing. For this purpose, the best plan is to put the powder into a common tin cup, tying a piece of very fine muslin over the mouth of the cup; or the powder may be simply enclosed in a bag of muslin of convenient size. In either case, the apparatus must be fastened to the end of a short stick, so as to avoid coming to too close quarters with it. It is best to select a moderately still day for the operation; as the powder is so exceedingly fine that on a windy day it is apt to get wasted.

To test the genuineness of the article, a very small pinch of it should be applied to the nose. If it is good and has not lost its strength by keeping too long, it will immediately produce a tingling sensation in the nostrils; if it does not produce this effect, it is worthless and should not be used. There is every reason to believe that in those cases where men have used White Hellebore to kill Currant Worms without any perceptible effect, that they had been deceived into buying an adulterated or worthless drug. Although, like almost all our medicines, Hellebore, in large doses, is poisonous, yet in minute doses there is no reason to be afraid of it; for, according to Dr. Fitch, it has long been in use as the basis of those snuffs, which are designed to excite violent and continued sneezing.

We might easily fill two or three columns, and distract the minds of our readers, by enumerating two or three dozen other remedies, which are highly recommended on good authority, and which may, or may not be as efficient as White Hellebore, but we prefer to "let well enough alone."

* The Article in the *Ohio Farmer* appeared in Vol. VII, p. 233, and is supposed by Dr. Fitch—to whom we are indebted for our knowledge of it—to have been written by Dr. J. P. Kirtland. Dr. Fitch, who entirely ignores *Pr. grossulariæ*, Walsh, supposes that the Ohio insect may perhaps be the European species, *Pr. rufipes*, St. Fargeau, which is not known to feed on gooseberry or currant.

INSECTS INJURIOUS TO THE GRAPE-VINE: No. 2.

The Hog-caterpillar of the Vine.

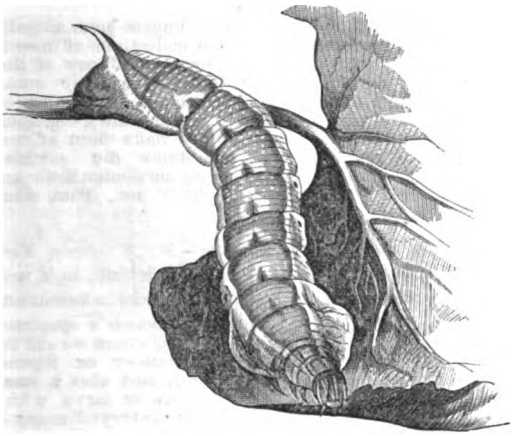
(*Chærocampa pampinatrix*, Smith & Abbott, alias *Sphinx* [*Darapsa*] *myron*, Cramer, alias *Otus cnotus*, Hübner).*

Of the large, solitary caterpillars that attack the Grape-vine, this is by far the most common and injurious in the Mississippi valley. We have frequently found the egg of this insect glued singly to the underside of a leaf. It is 0.05 inch in diameter, perfectly round, and of a uniform delicate yellowish-green color. The young worm which hatches from it, is pale-green, with a long straight horn at its tail; and after feeding from four to five weeks it acquires its full growth, when it presents the appearance of Figure 12, the horn having become comparatively shorter and acquired a posterior curve.

This worm is readily distinguished from other

* Of the four different generic names under which this species has been classified, "*Sphinx*" is a general term for all the Hawk-moths and refers to the sphinx-like attitude often assumed by their larvæ; "*Chærocampa*" is derived from two Greek words which mean "Hog-caterpillar;" and "*Darapsa*" and "*Otus*" are gibberish. Of the three different specific names, "*Myron*" refers to an ancient Greek who bore this appellation, "*cnotus*" is pure unadulterated gibberish, and "*pampinatrix*" is from the Latin and signifies "a female vine-pruner." Both Harris and Fitch describe this insect under the name of *Chærocampa pampinatrix*; and this, as the appellation best known to our grape-growers, and the most characteristic of the habits of the species, we should prefer to retain, although no doubt, according to the strict Law of Priority, the specific name of *Myron* ought to be employed. Mr. Walker, Dr. Clemens and Dr. Morris call this species "*Darapsa Myron*," and Mr. Grote calls it "*Otus Myron*." By ringing the changes with sufficient ingenuity upon the four generic and the three specific names, we may obtain no less than twelve different names for this one insect!

[Fig. 12.]

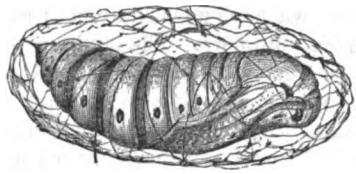


Colors—Pea-green, lilac, and yellow.

grape-feeding species by having the third and fourth rings immensely swollen, while the first and second rings are quite small and retractile. It is from this peculiar appearance of the fore part of the body, which strikingly suggests the fat cheeks and shoulders and small head of a blooded hog, that it may best be known as the Hog-caterpillar of the vine. The color of this worm when full grown is pea-green, and it is wrinkled transversely and covered with numerous pale-yellow dots, placed in irregular transverse rows. An oblique cream-colored lateral band, bordered below with a darker green and most distinct on the middle segments, connects with a cream-colored subdorsal line, which is bordered above with darker green, and which extends from the head to the horn at the tail. There are five and often six somewhat pale yellow triangular patches along the back, each containing a lozenge-shaped lilac-colored spot. The head is small, with yellow granulations, and four perpendicular yellow lines, and the stigmata or spiracles are orange-brown. When about to transform, the color of this worm usually changes to a pinkish-brown, the darker parts being of a beautiful mixture of crimson and brown. Previous to this change of color Mr. J. A. Lintner, of Schoharie, N. Y., has observed the worm to pass its mouth over the entire surface of its body, even to the tip of its horn, covering it with a coating of apparently glutinous matter—the operation lasting about two hours.* Before transforming into the pupa or chrysalis state, it descends from the vine, and within some fallen leaf or under any other rubbish that may be lying on the ground, forms a mesh of strong brown silk, within which it soon changes to a chrysalis (Fig. 13) of a pale, warm

* Proc. Ent. Soc.. Phil., III, pp. 663.

[Fig. 13.]



Colors—Yellowish and brown.

yellow, speckled and spotted with brown, but characterized chiefly by the conspicuous dark brown spiracles and broad brown incisures of the three larger abdominal segments.

The moth (Fig. 14) which in time bursts from this chrysalis, has the body and front wings of a fleshy-gray, marked and shaded with olive-

[Fig. 14.]

Colors—Gray, olive-green and rust color.

green as in the figure, while the hind wings are of a deep rust-color, with a small shade of gray near their inner angle.

This insect is in northerly regions one-brooded, but towards the south two-brooded, the first worms appearing, in the latitude of St. Louis, during June and July, and giving out the moths about two weeks after they become chrysalids, or from the middle of July to the first of August. The second brood of worms are full grown in September and, passing the winter in the chrysalis state, give out the moths the following May. On one occasion we found at South Pass, Ill., a worm but ½ grown and still feeding as late as October 20th, a circumstance which would lead to the belief that at points where the winters are mild they may even hybernate in the larva state.

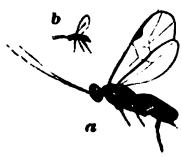
This worm is a most voracious feeder, and a single one will sometimes strip a small vine of its leaves in a few nights. According to Harris it does not even confine its attacks to the leaves, but in its progress from leaf to leaf, stops at every cluster of fruit, and either from stupidity or disappointment, nips off the stalks of the half-grown grapes and allows them to fall to the ground untasted. It is fortunate for the grape-grower therefore that Nature has furnished the ready means to prevent its ever becoming ex-

cessively numerous, for in all our entomological experience, we have never known it to swarm in very great numbers. The obvious reason is, that it is so freely attacked by a small parasitic Ichneumon fly—belonging to a genus (*Microgaster*) exceedingly numerous in species—that three out of every four worms that we meet with will generally be found to be thus victimized. The eggs of the parasite are deposited within the body of the worm, while it is yet young, and the young maggots hatching from them feed on the fatty parts of their victim. After the last moult of a worm that has been thus attacked, numerous little heads may be seen gradually pushing through different parts of its body; and as soon as they have worked themselves so far out that they are held only by the last joint of the body, they commence forming their small snow-white cocoons, which stand on ends and present the appearance of Figure 15. In about a week the fly (Fig. 16, *a*, magnified; *b*, natural size), pushes open a little lid which it had previously cut with its jaws, and soars away to fulfil its mission. It is one of those remarkable and not easily explained facts, which often confront the student of Nature, that, while one of these Hog-caterpillars in its normal and healthy condition may be starved to death in two or three days, another that is writhing with its body full of parasites will live without food for as many weeks. Indeed we have known one to rest for three weeks without food in a semi-paralyzed condition, and after the parasitic flies had all escaped from their cocoons, it would rouse itself and make a desperate effort to regain strength by nibbling at a leaf which was offered to it. But all worms thus attacked succumb in the end, and we cannot conclude this article to better advantage than by reminding the Grape-grower, that he should let alone all such as are found to be covered with the white cocoons we have illustrated, and not, as has been often done, destroy them under the false impression that the cocoons are the eggs of the worm.

[Fig. 15.]

Color—White.

[Fig. 16.]



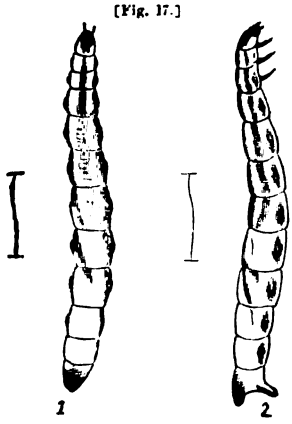
Color—Black.

ANSWERS TO CORRESPONDENTS.

Notice.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species. But to make them of real value, it is requisite that we know for certain, whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

Striped Cucumber Beetle—*M. M. Gray, Cardington, Ohio.*—We quote your letter in full, as it well describes the larva about which you desire information:

[Fig. 17.]

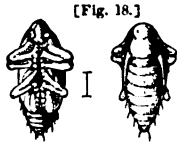


Color—Whitish.

I inclose a specimen of bug which we call the Cucumber or Squash bug, and also a small worm or larva which has destroyed many of my melon and cucumber vines. My object in part is to learn if this worm or larva is the product of the bug or something different and foreign to it. In the early part of the season the small striped bug commenced working on my vines, and they began to wilt and die. I used sulphur and plaster, quassia, tobacco, etc., to prevent or check their ravages, but with little effect. Finally I hunted out and killed a good many, and shortly they seemed to disappear, and my vines began to revive and grow. About three weeks later the vines began to wilt and die worse than before! But this time there were no bugs to be found. Upon examination of the roots, however, I discovered this little white-worm with a black head, from 1-16th to 1-4th of an inch in length, eating into and perforating the root and vine; and as the vines they infested the most were the same that the bugs preyed upon the worst, I conjectured there must be some relation between them.

The larva referred to which attacks the roots, and of which we present highly magnified figures (Fig. 17, 1, dorsal view, 2 side view), is in reality the young of the very same Striped Cucumber Beetle (*Diabrotica vittata*, Fig. 19), which is so injurious to the leaves; for we have ourselves bred the beetle from this larva, and in 1865 Dr. H. Shimer, of Mt. Carroll, Ill., first published an account of its transformations.* After boring into and around the roots for upwards of a month, the larvæ enter the surrounding earth, and within a smooth oval cavity soon change to pupæ (Fig. 18, 1, ventral view; 2, dorsal view), which are transformed to beetles about two weeks afterwards. There are two or three broods during the year. By getting rid of the beetles in the early part of the season, you of course prevent the injuries of the larva, and the most effective agents for this purpose, or at least those in which we have the most confidence, are Paris green and white hellebore. This insect has been very injurious the present year.

[Fig. 18.]



Color—Whitish.

[Fig. 19.]

Colors—Black and yellow.

* *Prairie Farmer*, Aug. 12, 1865.

Leafy Oak-gall—*B. H. B., Pickens' Sta., Miss.*—The cone-like leafy oak-gall which you send, and which we herewith illustrate (Fig. 20, *a*), is apparently the

[Fig. 20.]

Color—Green.

gall named *Quercus frondosa* by Bassett, meaning literally "full of green leaves." You do not mention the kind of oak on which it occurred, but from the fact that Mr. Bassett described his as occurring on the Chinquapin, yours might have been taken from this species, though we have found the same gall both on White and on Bur Oak. This gall is developed after the summer growth of the tree is completed, and the axillary bud, which otherwise would not burst till the spring following, is made, by the puncture of the gall-fly, to develop prematurely in the singular manner illustrated above. The cell (Fig. 20, *b*, section showing larva) containing the larva is half immersed in the apex of the cone, and though the perfect fly is unknown, the character of the larva indicates it to be *Cynipidous*. (See article on Galls, Vol. I, No. 6.)

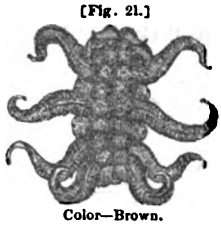
Drop of Gold—*B. H. B., Pickens' Sta., Miss.*—The "drop of gold in shape of a French loaf" attached to a leaf of the Shellbark-Hickory, is in reality the vacated egg-shell of some large moth, and not improbably of that large species which produces the Royal Horned Caterpillar. The smooth short-oval eggs of the same large Stinking Bug, which we figured on page 12 of our first Volume (*Metapodius nasalus*, Fig. 6, *b*), have, even when vacated by the young bug, just the same lustre of burnished gold. In July, 1868, at Lacon, Ill., we found a row of nine of these eggs, all arranged in regular order, like the beads of a necklace, upon a leaf of White Pine; and from these eggs we subsequently hatched out the young bugs.

The Luna Moth—*Geo. W. Kinney, Snow Hill, Mo.*—The immense green moth with an eye-spot in each wing and with each of the hind wings prolonged into a tail, is the Luna Moth (*Attacus luna*, Linn.) The specimen was ♀ and we were glad to get the eggs which she had deposited. The larva feeds on Walnut and Hickory.

T. W. Hoyt, Jr.—The large pale green swallow-tail moth which you describe is the Luna Moth referred to above.

Hag-moth Larva—*Dr. C. T. Farrell, South Pass, Ill.*—The curious brown slug-like larva found on Siberian Crab, of which a better idea can be formed by the accompanying illustration (Fig. 21) than by any descriptive words of ours, is the larva of the Hag-moth (*Limacodes pithecium*, Sm. & Abb.) When received, it had already moulted its long fleshy appendages and attached them to the outside of its round compact cocoon, and ten days subsequently the moth made its appearance. This moth is of a dusky brown color, the front wings variegated with light yellowish-brown. In the Northeastern States this insect is supposed to be single-brooded, but in your latitude it is probably double-brooded. The "spider-like animal" on Blackberries is the pupa of the Many-banded Robber (*Harpactor cinctus*, Fabr., see Vol. I, Fig. 44.)

[Fig. 21.]



Color—Brown.

M. B. Baldwin, Elgin, Ill.—The specimen you found on a spear of grass, and from which you detached, in handling, some of the appendages, is the same Hag-moth larva. At the time you found it, it was evidently in search of some cozy nook in which to form its cocoon, for it had already commenced the operation when it reached us, and the species has never been known to feed on grass.

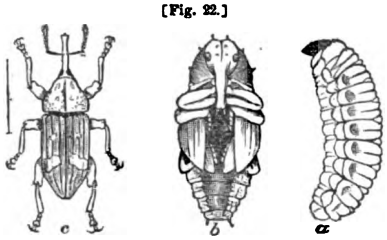
Stinging Bug—*J. M. Shaffer, Fairfield, Iowa.*—The singular craggy-looking bug, about 0.38 inch long, of a yellowish color variegated with brown, with the legs green and a transverse deep-brown band running superiorly across from one side to the other of the dilated abdomen, is *Phymata erosa*, Linn. The genus is characterized by the immensely swollen front thighs, and by the last joint of the antennæ being also swollen, this last character being a remarkable one, as Amyot and Serville well remark, in bugs of such carnivorous propensities. Your statement that one of these bugs stung you severely, does not greatly surprise us, though we never heard of their stinging before, and have handled hundreds of them with impunity. The stinging was of course done by the beak, which is 3-jointed and somewhat resembles that of *Harpactor cinctus*, Fabr. (Vol. I, Fig, 44, *b*.) The plant upon which you found these bugs we take to be *Parthenium integrifolium*, and Mr. A. Fender, of Allenton, Mo., is of the same opinion. We have noticed them ourselves in the latter part of the summer lying quietly in wait for their prey upon a great variety of wild flowers, but mostly on such as like themselves are of a yellowish color so as to conceal them from view. We have also often seen this Bug with its beak inserted into a small bee or a small wasp, which it is wide awake enough to hold at arm's length with its prehensile front legs, so that the poor unfortunate captive has no chance to sting it.

Pear-tree worms—*B. Hathaway, Little Prairie Ronde, Mich.*—The worms found on pear-tree leaves are the same Red-humped Prominent noticed in the answer to D. W. Kauffman of Des Moines, Iowa.

"Dobson"—*Fisherman*.—We cannot tell without seeing specimens, what it is that the disciples of the "gentle art" call "Dobson." It may be the larva either of some May-fly (*Ephemera*), or of some Dragon-fly (*Libellula*), or of a dozen other insects.

White Pine Weevil—*A. S. Fuller, Ridgewood, N. J.*—The borers which have been attacking the leading shoots of your Pines, gradually spreading to the branches, have produced the perfect beetle since their receipt, and as we anticipated, they turn out to be the White Pine Weevil (*Pissodes strobi*, Peck.) At Figure

[Fig. 22.]



Colors—(a and b) whitish; (c) rust-brown and white.

22 it is illustrated in its three stages of larva (*a*), pupa (*b*), and beetle (*c*). We have not known this insect to occur in the West, but it has long been known to be common in the Eastern States. The only practical way of counter-working the injurious work of this weevil, is to cut off the infested shoots and consign them to the flames, while they yet contain the larvæ and before the beetles have escaped. Dr. Fitch,* under the impression that most of the beetles are perfected in the spring, recommends that this work be done in August and September; but as all the beetles had issued from the shoots you sent, by the end of August, we should advise you, so as to be on the safe side, to do such work in July.

*Trans. N. Y. State Agr. Soc. 1857, p. 735.

Unnatural Secretion of Wax—*F. Brewer, Waynesville, Mo.*—The honey bee which has such a profuse waxy formation exuding apparently from the rings of the abdomen, and which you took alive from the entrance of one of your hives, presents a very unusual appearance, and a most remarkable case of wax formation. Mr. J. T. Langstroth, to whom we sent the specimen, suggests that the bee "had a kind of wax dropsy!" The specimen is interesting, and beautifully illustrates the manner in which the ordinary wax of our hives is secreted from the belly of the worker bee, as explained by Hübner, Reaumur, and other writers on the subject.

Raspberry Borer—*F. A. Gates, Massillon, Iowa.*—The borer you describe as having nearly ruined your patch of raspberry bushes, is apparently the common Blackberry and Raspberry borer (*Oberea perspicillata*, Hald.) which in the perfect state is a beetle. The large ochre-yellow moth, with a conspicuous white spot on the front wings, and each of the wings tinged with purple and crossed near the tip by a purplish line, which moth had deposited a large number of eggs on one of the raspberry leaves, was not, as you inferred, the parent of the borer. It is the Senatorial Dryocampa (*Dryocampa senatoria*, Fabr.) The young worms hatching from those eggs would have fed upon the leaves, though the more common food-plant of the species is Oak.

Cocoon of Horn-bug—*A. R. McClutchen, Lafayette, Ga.*—The egg-shaped cocoon formed of excrement and rotten wood glued together, contained the large white larva of some Horn-bug, probably *Lucanus dama*, Fabr.

Insects named.—*J. R. Muhleman, Woodburn, Ills.*—The moth, with the front wings variegated with light and dark brown with a conspicuous dark zigzag line running across the outer third, and with the hind wings of a lustrous coppery reddish brown, is the Pyramidal Amphipyra (*Amphipyra pyramidoides*, Guen). You say you bred it from a grape-feeding larva

[Fig. 23.]

Colors—Light and dark Brown.

like the one illustrated on page 225 (Fig. 163). We have also the present summer bred the same species of moth from a similar larva feeding on Red Bud, and have found the larva on the Poplar, which makes three distinct plants that it is known to attack. The specific name of the moth probably refers to the pyramidal hump on the 11th segment of the larva. You say you "recollect a similar larva in Europe on apricots, prune trees, etc., producing an analogous moth." Not at all unlikely, for there is a very similar worm common to the whole of Europe, and which feeds on Oak, Willow and Elm, as well as on fruit trees, and produces a very closely allied moth, the *Amphypyra pyramidea* of Linnæus. The other moth of which you send a pencil sketch, and which is of a uniform deep brown, with two oblique white lines running—the inner line entirely, and the outer one but partially—across the fore wings, is *Agnomonia anilis* of Drury, who states that the caterpillar is violet-white with longitudinal rose-colored lines and an elevated brown ridge across segments 4 and 11, and that it feeds on plants of the genus *Chironia*. The chrysalis is enclosed within a few leaves and is covered with a rosy efflorescence. The other pencil figure which you send seems to represent *Limacodes cippus*, Fabr. (See Harris, Inj. Ins., p. 420).

Cecropia Moth Caterpillar—*H. G. Lewelling, High Hill, Mo.*—The gigantic green caterpillar, covered with beautiful yellow, blue and coral-red tubercles, which you find on the leaves of an apple tree, is the larva of the Cecropia Moth (*Attacus cecropia*, Linn.) It is an immense feeder, and we have known it to be so abundant as to greatly injure young Apple and Soft Maple trees, but its occurrence in very large numbers is extremely rare. We shall figure this caterpillar in a future number.

Saml. H. I. Green, Elkart City, Ill.—The large worm found by you descending from an apple tree is the same as the above.

How Cut-worms originate—*Thos. W. Gordon, Georgetown, Ohio.*—You ask how our common cut-worms originate. They are produced from eggs deposited by obscure colored owlet moths belonging to several different genera, and for fuller information on the subject we refer you to the First Annual Report of the Junior Editor, where the history of twelve different species is detailed.

Red-humped Caterpillars on Apple and Pear—*D. W. Kaufman, Des Moines, Iowa.*—What you are irreverently pleased to term "a lot of ugly disgusting worms," but what we consider as one of the most gorgeously dressed caterpillars that God has created, is known as the "Red-humped Prominent" and produces a brownish yellow moth, called in English "the Trim Prominent" (scientifically *Notodonta concinna*). Do pray, Mr. Kaufman, for the future take a careful look at the wonderful Works of the Great Author of Nature, before you again slander and malign them, and call that "ugly and disgusting" which is in reality a perfect gem of insect beauty. Look at the brilliant coral-red head of your larva, and the hump on the middle of its back of the same lovely color! Did you ever see a string of coral beads, on the fair white neck of a young lady, show to greater perfection than do these bright red parts, among the delicate black, yellow and white lines traced lengthways by the finger of Almighty God along the rest of its body? Surely such artistically arranged colors can not be "disgusting" to any properly trained eye! But these worms are "ugly" forsooth! They are at most only about 1¼ inch long—they have no sting—no irritating hairs or prickles such as have the larvæ of a very few of our rarer moths—and they will not even bite, however much you may please to irritate and torment them. Surely a grown man ought not to fancy that so harmless a creature as this is hateful or formidable! But they ate all the leaves off one of your young pear-trees! Very well! They had just as good a right to do so as you have to sit down to your dinner, consuming vegetables and fruits that would otherwise have fed a host of beautiful creations which the vulgar denominate "bugs." God made this lovely green world for the pleasure and benefit not of man alone, but of the multitudinous hosts of the inferior animals. True, we have a right to destroy these inferior animals, when they interfere with our wants and wishes; and so we have a right to take the life even of our brother man, when our own life, and even in certain cases when our property merely, is jeoparded by him. "Kill and be killed" is the great law of Nature, from one end of the Animal Kingdom to the other. But when we are compelled to kill, let us always do it in a merciful and not in a wanton and cruel spirit; and especially, even when we are obliged in self-defence, or for purely scientific purposes, to take the life of some of these little miracles of perfection that the poet calls "winged flowers," let us not add insult to injury and slander them as "disgusting," when even Solomon in all his glory was not arrayed like the very meanest of them!

The Red-humped Prominent—of which we herewith represent the three stages (Figs. 24 larva; 25 pupa, and

[Fig. 24]

Colors—Black, white and red.

26 moth)—has hitherto been found only on rose, thorn, cherry, plum and apple, and especially on the last. Your finding it on pear, which is very closely allied to the apple, and yet is inimical to the life of several insects commonly found on apple, is a new fact. The species is not very common in the Valley of the Mississippi; but when it does occur, it occurs in great numbers, because the mother-moth deposits a very large number of eggs upon a single leaf. As these larvæ are gregarious throughout their entire existence, and do not scatter over the whole tree, as do many others that occur on our fruit trees—some of which wander off from the very earliest stage in their larval life, and others, as for example the common Tent Caterpillar (*Clisiocampa americana*), only toward the latter part of their existence in the larval state—they can always be easily destroyed. For ourselves, we never feel the least fear or scruple at crushing hundreds of any of these caterpillars in our naked hands; any one, however, that is more nice than we are can put on a pair of stout buckskin gloves before he commences the squashing process. But although we do not hesitate to squash any kind of caterpillar bare-handed, we by no means advise any one to try this operation, either upon the Colorado Potato Bug or upon any of the Blister-beetles. For all these last-named insects are more or less poisonous, and we have known a young girl make her hands very sore by crushing with her naked fingers a lot of the Ash-gray Blister-beetles, that were infesting some English beans.

[Fig. 25.]

Color—Brown.

[Fig 26]

Color—Brownish-yellow.

Insects named—*T. W. G., Georgetown, Ohio.*—The yellowish-green worm with an immense reddish-brown head with two yellow spots upon it, is the larva of the Tityrus Skipper (*Eudamus tityrus*, Fabr.) a brown butterfly with a semi-transparent yellow band across the front wings, and the hind wings each produced into a short rounded tail behind. This worm is most commonly found on Honey Locust, though it also feeds on the common Black Locust, on the Wistaria and on the False Indigo, (*Amorpha fruticosa.*) The dusky-brown tree-hopper with a long yellow spot each side and a horn-like projection from the fore part of its body is the Two-spotted Tree-hopper (*Thelia bimaculata*, Fabr.) which likewise occurs on Locust. The pale yellow and black worms all huddled together on the leaf of a Grape-vine are the larva of the American Procris (*Procris Americana*, Boisd.) If you have Harris's work on Injurious Insects you can find in it figures of all three of these species.

Gold Gilt-beetle—*Dr. W. H. Martin, Pinckney, Mich.*—The brilliant beetle, resplendent in a full suit of green and gold and about half an inch long, which you find devouring the leaves of the common Dogs-bane (*Apocynum androsæmifolium*), is the Gilt Gold-beetle (*Chrysochus auratus*). It is very common everywhere in the West upon this plant in the perfect beetle state, but as its larva is never met with there, it most probably during the larval state feeds underground upon the roots either of this or of some other plant. Your finding the beetle upon another species of the same genus of plants (*Ap. cannabinum*) is, we believe, a new fact.

The Trumpet Grape-gall—*D. McClaine, Piermont, N. Y.*—The reddish-brown, elongate-conical galls about one-third of an inch long, growing in considerable numbers from the leaf of a wild grape-vine, and which we represent at Figure 27, have long been

[Fig. 27.]

Color—Crimson.

known to us, and are described in our manuscripts under the name of the Trumpet Grape-gall (*Vitis lituus*). Like the other three grape-galls which we have figured, one of them in number 12 and the other two in number 6 of our first Volume, (pages 106, 107 and 247,) it is made by a Gall-gnat (*Cecidomyia*)—thus further exemplifying the truth of the general law, that when one species of any particular gall-making genus of insects is found to inhabit a particular genus of plants, many more species of the same gall-making genus can generally be met with on the same genus of plants. Specimens of this same Trumpet Grape-gall, said to occur on the Isabella grape-vine, were received by us three years ago from J. H. Foster, of Pennsylvania, as noticed in the *Practical Entomologist*, I. p. 101. We have seen very similar galls on a wild grape which we took for the Frost Grape (*V. cordifolia*). Two years ago, a very similar kind of gall, said to grow on the "Texas Mustang Grape-vine," were received by us from M. W. Phillips, of Mississippi. These last, however, differed in being green (not brown), and in growing in bunches of three or four (not promiscuously) on the leaf. (See *Pract. Entom.* II. p. 102). Several galls resembling yours and made like yours by Gall-gnats, one of which has been described by Osten Sacken as the Blood-red Hickory Gall (*Sanguinolenta*), and is of nearly the same crimson color as the Trumpet Grape-gall, occur on the leaves of different species of Hickory; and we are acquainted with two such galls that grow on Hackberry leaves.

Grape-berry Moth—*H. C. Barnard, M. D., Charleston, Ill.*—The worms which you sent, and which are injuring your grapes by boring into the berries, are the larvæ of the Grape-berry Moth (*Penthina vitivorana*, Pack.) of which we gave an illustrated account, with suggestions for its prevention, in our first volume, pp. 177-9.

Oak Pruner—*T. J. Plumb, Madison, Wis.*—Your insect is the common Oak Pruner (*Elaphidion putator*, Peck), of which you will find an account in Harris's Treatise on Injurious Insects, p. 98.

Potato Bugs—*Wm. R. Shelmire, Toughkinamon, Pa.*—The blister-beetle which infests your potatoes so grievously and also your tomato vines, is, as you suppose, the very same Striped Blister-beetle (*Lytta vittata*) which we gave an account of in No. 2 of our 1st volume, page 24, where a figure of the insect will be found. In Central Illinois, in the year 1868, we heard of an entire field of potatoes being utterly destroyed by this species in a single day. The tomato being so closely allied to the potato, it is not at all strange that you find this little pest to like it about as well as the potato, seeing that most of the Blister-beetles are pretty miscellaneous feeders. Your statement that it prefers other varieties of potato to the Mercer, or Neshannock as we call it out West, corresponds with the fact which we published in the passage just now referred to, namely, that it prefers other varieties of potato to the Peachblow. It would be a curious enquiry which of the two it would take, if it were absolutely restricted to Mercers and Peachblows. The only approved remedy against all the different kinds of potato-eating Blister-beetles, which are no less than five in number—namely, the Striped, the Ash-gray, the Black-rat, the Black, and the Margined Blister-beetle—is to drive them to leeward with brush into some dry hay or straw previously prepared for their reception, and then to set fire to the dry stuff and burn them all up.

The whitish 16-legged larva, nearly an inch in length and with its head and the first ring of its body mahogany brown, which you found burrowing in a potato stalk, is unknown to us. All that we can at present say is, that it would have produced some kind of moth if it had lived to maturity. As you suggest, it is quite different from the common Stalk Borer infesting the potato, which we figured and described on page 22 of our first volume, this last larva being distinctly striped lengthwise with black. If you had packed this larva of yours according to our printed directions, in a small tight tin box along with a little of its natural food, it would have doubtless reached us in good health, and we could have probably bred it sooner or later to the moth state. As it was, you packed it along with a small morsel of potato stalk and a very large allowance of cotton wool, in a pasteboard box. Consequently, long before the three days expired, which it takes Uncle Sam to travel from Pennsylvania to Illinois, the poor unfortunate larva had perished, partly of starvation but principally of drought. If you had replaced the cotton wool by pieces of potato stalks, retaining the pasteboard box, the insect might perhaps have reached us alive; but the cotton wool effectually did its business. You might as well pack a trout in dry sand and expect it to live and flourish, as pack the inhabitant of a juicy potato stalk in dry cotton wool, and believe that it will not give up the ghost in a very short time.

Blood-sucking Cone-nose—*G. W. C., Alton, Ill.*—Yes, the bug which by its "bite" caused your nephew's arm to swell so badly, is the above insect, which was figured in AMERICAN ENTOMOLOGIST, Vol. I. p. 88, (Fig. 74.) The fact that for a year after the bite the child's arm would swell in the same place, whenever he was unwell, is singular. Your observations about the perfect winged Bug preying on the common Bed-bug are new, but corroborate our inference that, in the larval and pupal states, this species probably sucks the juices of other insects.

Wooly slug-like worm on Apple—*H. A. Green, Atco, N. J.*—The slug-like worm found on a young apple tree, and which is covered above with thickly set, long, but evenly shorn light-brown hairs, these hairs generally meeting and forming a sort of ridge along the back and along each side, is the larva of the Rabbit Moth (*Lagoa opercularis*, Sm. and Abb.) This moth is cream-colored with thick wooly body and legs, and with the basal portion of its front wings covered with curly wool which is marked more or less with rusty black. The generic name which comes from the Greek, signifies of, or belonging to, a rabbit, and was given by Dr. Harris on account of the short, squat form and smooth fur of the larva. The species is not likely to be troublesome, for it has long been considered a rare insect; though we received it last year from a correspondent in the East, who stated that he had met with it in very considerable numbers on one of his apple-trees.

And now Mr. Green, you deserve a good scolding! As often as we have remonstrated against sending insects folded loose in a letter, you persist in committing the same offense. Here is a choice and rare larva, which we should have been much pleased to have reared, and you send it all the way from New Jersey to St. Louis, folded loose in a letter, in the vain hope that it would reach us alive. Well, by some miracle or other it was not entirely squelched by Uncle Sam's canceling stamps, but it had been so effectually squeezed in the mail bags that life was past recovery. And when we ponder, Sir, over the torture and lingering death which you caused the poor creature by your careless packing, we feel strongly inclined to report you to the "Society for the Prevention of Cruelty to Animals" and have you suffer the highest penalty of the law. The only way we can think of, for you to exonerate yourself from prosecution for such a heinous crime, is to bribe us to keep "mum" by sending us another specimen properly packed!

A Water-Bug.—*W. V. Smith, Brooklyn, N. Y.*—The brown-colored and very slender Bug, almost three inches long, including the slender bristle-like tail that projects from its hinder extremity, and with long slender legs, is the *Ranatra fusca* of Beauvois. An almost exactly identical species occurs in Europe, which is known as *Ranatra linearis*. This insect belongs to the same *Nepa* Family of the Half-winged Bugs (*Heteroptera*) as the Gigantic Belostoma, of which we gave a figure on page 249 of our last number. This entire Family inhabits the water, though they are all provided with wings by means of which they are enabled to fly from pond to pond; and they are all of them Cannibals, their front legs being metamorphosed into arms to seize their prey with. Your insect is very common out West in shallow sluggish pieces of water. We have never met with any in running brooks, which, as you say, is the situation in which your specimen was found.

Goldenrod Galls—*G. W. C., Alton, Ill.*—The round, pithy galls which you find on the stems of the Goldenrod (Solidago,) each containing a maggot in the centre, are formed by a two-winged fly *Trypeta* (*Acinia*) *solidaginis*, Fitch. The "bushy bunch of leaves" at the extremity of the same plant is, as you rightly suppose, a gall; but it is made by a Gall-gnat (*Cecidomyia solidaginis*, Lœw), and not by the same Gall-fly which produces the round gall.

Oak-leaf Gall—*B. H. Broadnox, Pickens' Sta., Miss.*—You send us a spherical but somewhat depressed gall on the leaf of the Black Jack Oak (*Quercus nigra*), about the size of a small pea, but several of them often running together into an irregular mass; its under surface pale green and flattened, with a central nipple, its upper surface dark blood-red or crimson, much rounded, and often divided by slender grooves into from 12 to 20 four-five-or six-sided compartments, like the back of a tortoise. This gall was described in 1864 under the name of the Oak-pill Gall (*Q. pilulæ*) by the Senior Editor. The specimens you sent contained the larva of a Gall-fly (*Cynips*), and the Senior Editor, from the fact of his having actually bred certain Guest Gall-flies from this gall, when he published his description, supposed the gall to be the work of some unknown gall-making Gall-fly. Subsequently, however, he became aware that the real gall-maker was not a Gall-fly (*Cynips*), but a Gall-gnat (*Cecidomyia*), and that the very same gall had been briefly described, but not named, by Osten Sacken in the year 1862 as the production of a Gall-gnat. Up to this period this was the first published case of a Gall-fly living as a guest in a gall made by a Gall-gnat; but several other such cases have since been discovered. The true gall-making larva of this Oak-pill Gall, which larva, as already stated, produces not a Gall-fly, but a Gall-gnat, is orange-colored, with a very small pointed head and a clove-shaped "breast-bone;" (see our figure 86 *a*, Vol. I, No. 6;) on the other hand, the larva of the Gall-fly that inhabits this gall as a guest is whitish, sometimes with a dark stomach, and has a large round whitish head with long robust horny black jaws, which in the living insect may often be seen to open and shut in a vicious manner. The former does not develop to its full size till about the time of the fall of the leaf; when it leaves the gall and is supposed to go under ground and come out the next summer in the perfect fly state, ready to deposit its eggs upon the next year's crop of oak-leaves. On the other hand, the larva of the Guest Gall-fly does not leave this gall till it assumes the perfect or winged state.

Hitherto, this gall has only been met with upon Black Oak (*Q. tinctoria*), and Red Oak (*Q. rubra*), upon which trees in certain seasons it swarms so prodigiously, that almost every leaf bears at least half a dozen of them, and some leaves are studded all over with them. Your finding it upon the Black Jack Oak is a new fact, but it is quite in accordance with the general rule, because that Oak belongs to the same great group of the genus *Quercus* as the Red and Black Oaks, and because there is no known Oak-gall that occurs indiscriminately upon certain species belonging to the White Oak group and upon certain other species belonging to the group of the Red and Black Oaks. Botanically, these two groups of Oaks differ in this very notable character, that while it requires two years to perfect the acorn of the Red and Black Oak group, the acorn of the White Oak group is perfected from the blossom in a single season. There is a very closely allied gall, the Symmetrical Oak-leaf Gall of Osten Sacken, also produced by a Gall-gnat, which scarcely differs from yours except in the lower surface being as much rounded and of the same crimson color as the upper surface. It is very satisfactory that this gall also occurs on a species belonging to the Red and Black Oaks—namely, the Spanish Oak (*Q. falcata*).

Humble Bees—*Charles S. Davis, Decatur, Ill.*—There are about fifty distinct species of Bumble or Humble Bees found in North America, of which rather more than half the number occur in the United States, including our new possessions in Alaska. In the immediate neighborhood of Rock Island we have taken about ten different species. The species differ notably in the amount of yellow markings, but have all of them the same general appearance; they differ also in size.

As with all other social insects, there are three distinct forms in every species of Humble Bee, like the drones (or males), the queens (or perfectly fertile females) and the workers (or partially fertile females) among the honey-bees. Among the Humble-bees, it is only the queens or large females that live through the winter and start fresh nests in the spring; the workers or small females always die in the fall. These last, for the most part, only differ from the queens in being about two-thirds their size. It is the queens alone that are seen in early spring flying round apple blossoms, etc., the workers not being born till later in the year.

The specimens you send are genuine Humble-bees—workers—and belong all of them to our commonest species in the U. S., the Pennsylvania Humble-bee (*Bombus pennsylvanicus*. De Geer). This kind makes its nest in the ground; and there were probably several of their nests in your hay-field, which your hay-making operations disturbed. Hence they attacked your teams, as a hive of honey-bees will fight if you disturb them. You state yourself that they troubled you a good deal while making hay, and say nothing about their disturbing your teams at any other time or in any other place. No doubt if you had let them alone, they would have let you and your horses alone. You must not blame them for fighting for their families. We presume you would do the same if our Indian friends were to make an onslaught upon your household gods.

With the exception of a few solitary bees (belonging to the genera *Halictus* and *Andrena*), which are known as "Sweat-bees," and having a taste for human sweat often get under folks's shirts in the hot summer weather and sting if roughly handled, there is no kind of Bee or Wasp that does not let man severely alone, if man will be good enough to do the same by him. And what is true of man, is equally true of the different animals domesticated by man.

As with all Bees and Wasps, including the Honey-bee, the males of all the Humble-bees have got no sting at all. In the case of certain species, the male Humble-bee haunts flowers for the sake of the honey and pollen found therein; in the case of other species, they fly idly about till they die of starvation, as we have observed to be the practice of the male of your species. In no case, however, does any male Humble-bee, or indeed any male Bee or Wasp belonging to any species, gather up provisions for the nest. Like the red Indians, the males are too chivalrous to work themselves, and it is upon the females that all the labor of providing for the family devolves.

Insects for sale—*H. M. G., Chicago, Ill.*—Yes, we understand that the extensive collection of N. A. Lepidoptera, belonging to Mr. Geo. M. Peck, is for sale as a whole, or in part. It has been represented to us as being one of the finest private collections in the country. Mr. Peck's address is 129 Maiden Lane, New York.

Can Land be insured against Cut-worms and other Insects!—*A. Willis, Columbia, Mo.*—In answer to your queries, we regret to say that we know of no kind of preparation which you can apply to your clover land, so as to insure the nursery stock you intend planting upon it next spring, against the depredations of insects. The habits of these lilliputian foes are so diverse, and we have to fight them in so many different ways, that it is impossible to apply any particular remedy or preventive that will affect them all. We think that the best thing you can do, is to keep the land plowed clean until you wish to use it. It was formerly supposed that a clean summer and fall fallow would insure the crops planted the following spring, against the attacks of Cut-worms. But since we have shown that some of these worms, which are so injurious in May and June, are produced from eggs deposited the same spring,* and that all Cut-worms do not hatch the year before they attain their growth, it follows that this clean fallow will be but a partial prevention of their attacks.

* See Missouri Ent. Rep., pp. 72-3, and *Amer. Entomologist*, Vol. I, p. 188.

Beetles named—*T. W. Hoyt, Jr.*—Your golden beetles are *Cassida aurichalcea*, Fabr. (See Vol. I, Fig. 177.) The beetle with blue-black wing-covers and rufous head, thorax, legs and antennæ, which "made a sort of crackling noise and emitted smoke which smelt like sulphur from the hind part of his body," is one of our common Bombardier beetles, *Brachinus Americanus*, Lec. Upon one occasion, when we were collecting insects and—as often happens—saw at the same moment two rapidly running beetles, both of which we were desirous to capture, we thoughtlessly put one of the two, which happened to be a Bombardier, between our lips, so as to hold him securely while we caught and disposed of the other one. Forthwith he fired away the customary discharge of blue smoke from his tail; and the next instant our lips felt as if a bottle of the strongest Aquafortis had been emptied upon them. But we were not to be fooled thus. The more he blazed away the tighter we held him; and after a copious discharge of saliva from our mouth, the disagreeable sensation passed off in some five minutes, without any further unpleasant results.

Royal Horned-Caterpillar—*W. C. Holmes, Plattsburg, Mo.*—The immense horned worm you send, is the species which was illustrated in the colored plate to our first volume.

M. G. Kern, Supt. Lafayette Park, St. Louis, Mo.—The worm you found on Lilac is the same Royal Horned-Caterpillar. The fact of its occurring on Lilac is, we believe, entirely new to science.

Parsnip Caterpillar—*T. W. Hoyt, Jr., St. Louis, Mo.*—The worms found on Parsnip, which are green, marked with transverse black stripes and yellow dots, and which protrude from the first segment, when disturbed, two orange-colored strong-smelling processes, are the larvæ of our most common black swallow-tail butterfly, *Papilio asterias*, Cram.

Bad packing—*Dr. W. W. Butterfield, Indianapolis, Ind.*—Owing to your bad packing, the glass vial, containing the "aquatic insects," broke in Uncle Sam's mail-bags, and not a solitary bug of the whole lot reached us. We only hope that none of them crawled into some young lady's love-letters, while they were rampaging round among the postal matter.

Insects named—*C. P. Faulkner, Bridgeport, Conn.*—No. 1 is not *Necrophorus americanus*, Oliv., which is a much larger and handsomer insect with the elevated middle part of the thorax looking like red sealing-wax, but *N. marginatus*, Fabr. Both have similar burying habits. No. 2 is *Creophilus villosus*, Grav.—usually found under small pieces of carrion, where it preys upon carrion-eating insects. We have noticed the allied *Listotrophus cingulatus*, Grav., which haunts cowdungs, fly off from its favorite abode with a large *Hister* in its mouth. No. 3 is *Coccinella bipunctata*, Linn. No. 4 is not *Melanotus communis*, Schönh, but *M. incertus*, Lec. The two are very closely allied, but *incertus* is on the average a considerably larger species. No. 5 is *Scarites subterraneus*, Fabr. We have dug up many of this species from the burrows of the large southern Dung-beetle, *Copris carolina*, Linn., and believe that it lays its eggs there and in other such situations, and that its larva lives upon dung-feeding larvæ. No. 6 is *Uloma impressa*, Melsh., very abundant in all its stages under decaying bark in the woods. This species was formerly confounded with *U. culinaris* of Europe, which, as the name denotes, haunts kitchens. No. 7 is *Ips fasciatus*, Oliv.—The *Elater* family is a very difficult one, very numerously represented in the U. S.; and it is impossible to identify your species from your description, which neither specifies the size nor includes a single generic character.

Beetle named—*Wade Keyes, Florence, Ala.*—Your Beetle is *Culopteron* [*Lycus*] *terminale*, Say, and is tolerably common, occurring on a variety of different plants. The larva, which is clay-yellow prettily spotted with black, and very closely resembles the wingless female of the European genus *Drilus* as figured by Westwood (Introd. I, p. 247, fig. 13), occurs under prostrate logs, where it no doubt feeds upon the numerous larvæ that are found in such situations We have bred this beetle through all its stages, and upon one occasion, having determined to preserve a pupa of this species as a cabinet specimen, we pinned it through the thorax with a very fine No. 8 pin. Directly after we had done this, we changed our mind, removed the pin, and replaced the pupa in the breeding-jar. A week or two afterwards this very same pupa developed into a perfect specimen of the beetle; thus showing how tenacious of life some insects are. If a lamb was run through the breast with a sword, and then left to shift for itself, it would not be very apt to develop into a perfect full-grown sheep. LeConte in his Catalogue, but not in his edition of Say's *Entomology*, considers *terminale* Say as a mere variety of *reticulatum* Fabr., which has across the middle of its wing-cases an additional black band, but is otherwise undistinguishable. We have captured hundreds of both forms, and as we have never met with any intermediate grade, we incline with Say to think *terminale* a true species. It would be interesting to know whether or not *reticulatum* differs in its larval and pupal stages from *terminale*.

Moth named—*W. G. Barton, Salem Mass.*—The moth which you describe as having the front wings pink edged at tip with yellow, is probably *Alaria florida*, Guen. This insect expands about one and a quarter inches, and you will find an account of its larva by Mr. W. Saunders in the *Canadian Entomologist*, Vol. II, page 6, or in Dr. Fitch's twelfth Report. It feeds on the Evening Primrose (*Œnothera.*)

Worm boring into Cucumber—*G. W. C., Alton, Ill.*—The pale worm which enters and bores into your cucumbers, and which is nearly of the same color as the inside of that vegetable, produces a very strikingly marked moth of a yellowish-brown color, with an iris-colored reflection, the front wings having an irregular semi-transparent dull yellow spot, not reaching their front edge, and constricted at their lower edge, and the hind wings having their inner two-thirds of this same semi-transparent yellow. The moth is new to us, and during a recent trip East we found no Entomologist who could identify it. It belongs to the genus *Phakellura*, and is evidently Cramer's *nitidalis*, though the larva is said by Guenée to feed on potatoes. We have found this worm quite common in southerly latitudes the present year, boring into melons, both musk and water. A very similar worm, which however we have not yet bred to the moth state, has been this autumn exceedingly destructive to the cucumbers near Rock Island, in Northern Illinois. In company with this, but in smaller numbers, we have also met with a rather smaller worm, of a pale light yellow color and dotted with black very much like the larva of the Currant Worm Moth. (See Figure 8, *aa* in this Number). We have not yet reared this last to the moth state, but hope to do so before long. Of course, in a northerly latitude, insects do not develop as early in the year as they do further South.

O. L. Barler, Alton, Ill.—The worms which have ruined so many of your Nutmeg Melons by boring into them, and causing them to rot, are the same species spoken of above.

E. S. Smith, Pevely, Mo.—The worm boring into your Crook-neck and Hubbard squashes is the same species.

Caterpillar of the Io Moth—*Mrs. Tildesley, West Baden Springs, Orange Co., Ind.*—The grass-green worm found on Locust, with a conspicuous white and lilac-colored line along each side, and covered with numerous tufts of yellowish-green prickles, is the larva of the Io Moth (*Saturnia Io*, Sm. and Abb.) The moth receives its name from two conspicuous eye-spots on the hind wings, in allusion to the ancient Greek heroine Io, who, as the fable went, was jealously guarded by the hundred-eyed Argus. The sexes differ very greatly from each other, the general color of the ♂ being deep yellow, while that of the ♀ is purple-brown; though the same pattern is observable in both. The caterpillar is capable of stinging with its spines.

Worms on Cherry and on White Beech—*D. B. Waite, Springwater, N. Y.*—The worm that is "playing foul with your cherry trees" had spun himself up before he reached us; but from a peep that we got at him through a rent in the cocoon, he appears to be different from anything known to us. The other larva that usually feeds on beech, but will also eat grape leaves, was also spun up; and as we have no beech near us and are almost entirely unacquainted with the insects that infest that tree, we thought it useless to disturb him; more especially as, if the cocoon was cut open, the larva would most probably die, and by nursing the cocoon carefully through the winter we hope to breed the moth from it next summer. If we succeed next year in rearing the moths from either or both of your two cocoons, we will take care to advise you immediately what they are.

Apple-tree worms—*H. K. Vickroy, Champaign, Ill.*—The small green 16-legged larvæ, nearly half an inch long and with a broad dark brown stripe on each side extending the whole length of their backs, which you find doing considerable damage to the Apple-tree, belong to a new and hitherto undescribed species. These larvæ were first communicated to us by A. C. Hammond of Warsaw, Ill., early in Sept. 1868; and subsequently at the Illinois State Fair specimens were shown to us by W. T. Nelson, of Wilmington, Ill. At the latter end of May, 1869, we bred the moth from them; and a full account of the species, illustrated by figures, will be published in the Second Annual Report of the Senior Editor. The mode in which this larva operates on the apple-tree is by tying together the leaves with silken cords, forming a mass of considerable size inside which it lives gregariously, skeletonizing the leaves that it has thus appropriated and filling them with its gunpowder-like excrement. It was so abundant in 1868 near Warsaw and Quincy as nearly to strip many trees, especially in young orchards that were in an unthrifty condition. It is quite different from the Rascal Leaf-Crumpler (*Phycita nebulo*, Walsh), which lives all the time in a little black horn-like case, whereas this larva carries no house on its back. And moreover the Leaf-Crumpler is solitary in its habits, whereas this species lives in communities of several dozen during its entire larval life. As to the moths produced from these two larvæ, they are as different from each other as a goat is from a sheep. To distinguish our species from the Rascal Leaf-crumpler, we may call it in English "Hammond's Leaf-tyer" (*Acrobasis Hammondi*, n. sp.)

Stinging larvæ—*J. C. Falls, New Albany, Ind.*—The lepidopterous larvæ which you send are those of the Saddleback-moth (*Empretia stimulea*, Clemens), a species which has derived its English name from the saddle-like dark spot on the middle of its back. The two scientific names are derived respectively from a Greek word which means "to burn," and a Latin word which signifies "a goad." We shall shortly publish an article on "Stinging Larvæ," giving figures and descriptions of the very few that possess this peculiar power, so that our readers—and especially our fair readers, whose hands may be presumed to be more delicate and susceptible than those of us rough bearish men-fellows—may take due warning and govern themselves accordingly. Our own experience is that these larvæ produce no effect whatever on the palm of the hand, but if any of their sprangling prickles touch the back of the hand, or any other part of the body where the skin is not hardened and horny, then the result is about the same as if the same part had been stung by nettles.

Lappet Caterpillar on Apple-tree—*William Stark, Louisiana, Mo.*—We regret to say that the first caterpillar you sent was so rotten and stank so badly, that we were glad to fling it away the moment the box containing it was opened. The second "ugly wooly worm" found high up on a Rome Beauty Apple-tree, and which was broad and perfectly flat below, with fleshy, lappet-like appendages at its sides, was the larva of the American Lappet Moth (*Gastropacha Americana*, Sm. & Abb.) which you may find figured on page 377 of Harris's Injurious Insects. The species is rather rare, and there is but little risk of its undue multiplication.

Spined Spider—*G. W. Kinney, Snow Hill, Mo.*—The odd-looking angular spider, of a shiny mahogany brown, with the upper part of the abdomen yellow, and with two immense spines or thorns projecting from behind, and other smaller ones from above, is *Epeira spinea*, Hentz. It was subsequently described as found sparingly near Murphysboro, in South Illinois, by *Vespa* (Cyrus Thomas?) in the *Prairie Farmer* for 1861 (Vol. 23, page 169), under the name of *Epeira* (*Gasteracautha*) *spinicauda*. Near Rock Island, in North Illinois, it is by no means uncommon.

T. W. Gordon, Georgetown, Ohio.—The spider sent by you is the same species spoken of above in answer to Mr. Kinney.

Dangerous looking—*Dr. M. M. Kenzie, Centreville, Mo.*—The "dangerous looking" hairy ant-like insect of a black color with the forehead, upper part of thorax and two broad bands on the abdomen of a deep rufous, is ♀ *Mutilla coccinea*, Linn. The ♂ is somewhat smaller and has wings. This insect belongs to the Digger Wasps, and the sting of ♀ is said to be exceedingly severe.

Bag-worms again—*T. C. Tipton, Williamsport, Ohio.*—The worms which are literally eating up your Cedar trees are the common Bag-worm, which we have already frequently referred to under this head. We shall publish an article on this insect in our next number. *The Tomato-worm cannot sting!* The common House-fly breeds in stable manure. We shall give its natural history whenever we can spare the space.

Large water beetle—*S. E. Munford, Princeton, Ind.*—In our answer to you last month, we should have mentioned that the water-beetle you sent was ♀, and that in the ♂ the wing-covers, instead of having longitudinal impressed lines, are perfectly smooth, with the exception of the normal rows of fine punctures. Thos. Say, who was the first to describe this species, was not acquainted with the ♂.

Beetles under dead Fish—*T. Ferrell, Frankfort, Ohio.*—The large beetles with round, deep brown wing-cases and yellow thorax with a central dark spot, which you found under a dead fish, are *Silpha* (*Necrophila*) *peltata*, Catesby. They feed on all kinds of carrion.

ERRATA IN VOL. 1, No. 12.—Page III, column 2, line 36, for "*Brachyrynchus*" read "*Brachyrhyncus.*" Page VII, column 2, line 1, for "Stinging" read "Stinking." Page 235, column 1, line 3 from bottom, for "169, ²" read "174, ²." Page 242, column 1, line 18, for "*Musea*" read "*Musca.*" Page 250, column 1, line 12 from bottom, for "*Therydopteryx*" read "*Thyridopteryx.*" Same page, column 2, line 7 from bottom, for "Cartwell" read "Hartwell." Page 251, column 1, line 18, for "Welsh" read "Melsh."

☞ Several answers that should have appeared in the present number, must unavoidably lie over till our next issue.

☞ Our acknowledgements and notices of new works have also been crowded out of this number.

Vol. 2. APRIL, 1870. No. 6.

THE AMERICAN ENTOMOLOGIST AND BOTANIST.

AN ILLUSTRATED MAGAZINE devoted to PRACTICAL AND POPULAR ENTOMOLOGY AND BOTANY.

EDITORS:
CHAS. V. RILEY,
GEORGE VASEY.

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VOL. 2. ST. LOUIS, MO., MAY, 1870. NO. 7.

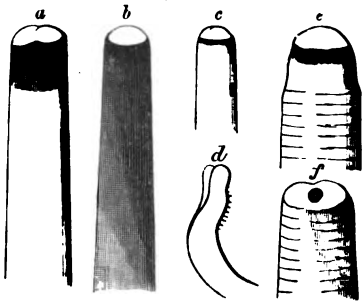
Entomological Department.

CHARLES V. RILEY, EDITOR,
211 N. Main st., St. Louis, Mo.

THE GORDIUS, OR HAIR-WORM.

BY PROFESSOR JOSEPH LEIDY, PHILADELPHIA

[Fig. 119]



Though by no means common, most persons, at least those living in the country, are more or less familiar with the curious animal known under the various names of Hair-worm, Hair-snake, and Horse-hair worm. Usually a single specimen is observed at a time, sometimes in a rain puddle in a hollow or wagon-rut by the wayside, or in a drinking-trough at a village inn, attracting attention by its active and incessant wriggling movements, bending from side to side and curving in all directions, and giving rise to the impression that it is writhing with pain. Its resemblance in form and color to a horse hair, coupled with the position in which it is ordinarily noticed, has given rise to the world-wide popular belief that the creature is actually a transformed horse-hair—one that by maceration has become endowed with independent life, and the inherent power of movement. I once saw, in an old English periodical, an attempt at an explanation of the manner in which horse-hairs, in the process of decomposition, gave rise to movement, which induced me to try the experiment of making hair-worms. I need hardly say that I looked at my horse-hairs for many months without having had the opportunity of seeing their vivification.

The Hair-worm is, however, a distinct animal, having no further relationship with a horse-hair than in its general likeness, which is by no means an exact one. When sought for in the proper places, as is the case with many other animals, the Hair-worm is much less rare than is generally supposed. In the latter part of summer or the beginning of autumn, in the search for the animal, I have frequently found it, while sauntering along the banks of a river or creek, in little hollows close to the shore. It requires some practice to discover it, as usually it is comparatively quiet in such situations, and may readily be confounded with the blackened, decomposing vegetable fibres occupying similar places. Sometimes it is found single, and at others a number are discovered coiled together in a loose, but intricate-looking knotted mass. Such knots, which had passed through the water pipes and issued at hydrants in our city, I have seen on two occasions. Similar knots, no doubt, were the source of the scientific name of the worm, that of Gordius, applied to it by Linnæus, from the fabled Gordian-knot of antiquity. The Gordius, however, not only resembles the latter in the intricate condition into which it sometimes gets, but its history is yet in part a Gordian-knot to be unraveled.

The worm is perhaps the hardest or most resistant to the feel of any of its Order, and it is tough and elastic. It is very tenacious of life, and when cut into several pieces will continue to live and move for some time afterwards.

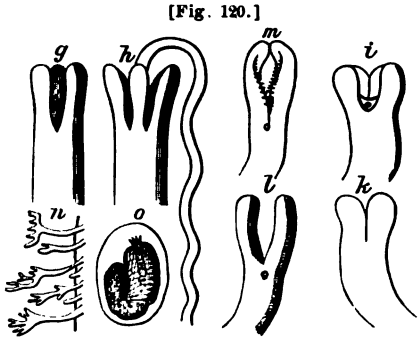
Linnæus accepted a popular error in regard to the Gordius. In his *System of Nature* he says that, "if the worm is incautiously handled it will inflict a bite at the ends of the fingers, and occasion the complaint called a whitlow." It is sufficient to refute such a fancy when it is learned that the animal has neither jaws nor other instruments by which it could either bite or sting.

A number of species of the genus have been noticed in different parts of the world. Several European species have been described, and we have as many in this country which appear to be quite distinct from the former. The more

common American species of the worm I have named the Variable Gordius (*G. varius*) from its presenting some variety of character.

The worm is cylindrical, of pretty uniform diameter, but slightly narrowed at the ends. It is smooth and lustrous, and varies from a light yellowish-brown to a chocolate-brown, sometimes nearly black. It is usually much coarser than a horse-hair, to which it is so commonly likened. The head end is marked by a ring of darker color (see Fig. 119, *a*) than the rest of the body. The ring appears darker in contrast with the lighter condition of the latter, and may be obscured entirely in the nearly black varieties (Fig. 119, *b*). The summit of the head appears as a convex whitish prominence included within the ring, and is composed of a thinner membrane than the rest of the integument.

[Fig. 120.]



The tail end of the male makes one or two spiral turns, and terminates in being forked. The tail end of the female is straight, and ends in three lobes (Fig. 120, *g h*). The male varies in length from 4 to 6½ inches, with the thickness from 1-5 to ¼ of a line. The female ranges in length from 5 inches to a foot, with the thickness from ¼ to ½ of a line.

The males of this, which I have regarded heretofore as of one species, present two varieties, each of which I now suspect to indicate a different species. In the one variety, usually more robust than the other, the forks of the tail are not longer than the thickness of the body—as seen in Figure 120, *k*, which represents a dorsal view. Between the base of the forks, on the ventral surface (Fig. 120, *i*), there is included a crescentic fold in which may be seen the genital pore. In the other—usually of more slender form—the forks of the tail are two or three times the length of the thickness of the body (Fig. 120, *l*), and the forks do not include at their base a crescentic fold as in the former. The genital pore is a little in advance of the division of the tail. The species, probably indicated in this last form, might be distinguished by the name of the Long-lobed Gordius (*G. longilobatus*).

A more delicate species than the former I have named the Linear Gordius (*G. lineatus*). It was indicated by half a dozen specimens obtained by Prof. S. F. Baird, from a spring in Essex county, New York. It is of a light clay-color, and has no dark ring encircling the head, which is represented in Figure 119, *c*. The tail end of the male (Fig. 120, *m*) is forked very much as in the Long-lobed Gordius, but the forks are furnished on their inner margin, ventrally, with a fringe of minute processes, such as are represented, highly magnified, in Figure 120, *n*. The tail end of the female is blunt and unprovided with lobes, the genital pore occupying the centre of the extremity, as seen in Figure 119, *f*, the similar end of a larger species, to be next described. The male measures from 5 to 7 inches in length, by 1-6th of a line in thickness. A single female accompanying the males was 5 inches long and 1-5th of a line thick.

Numerous specimens of a much larger species of Gordius than any of the preceding, were sent to me some years ago by Dr. Wm. A. Hammond, who obtained them 525 miles west of Fort Riley, Kansas. They were discovered in large numbers in a pond, in company with the curious batrachian Siredon, or so-called Fish-with-legs. They swam actively just beneath the surface of the water, and occasionally protruded the head above into the air. They are of a light yellowish-brown, with the head end encircled by a narrow band of darker hue, as represented in Figure 119, *e*. The males are darker than the females. The tail end of the former resembles that of the male of the Variable Gordius (Fig. 120, *i k*). The tail end of the female (Fig. 119, *f*) is blunt, and exhibits the genital pore in the centre surrounded by a brown ring. The body of this Gordius is more annulated than in any of the other species. The males measure from 8 inches to 2 feet 2 inches in length, and 1-4 to 2-5ths of a line thick. The females measure from 1⁰ inches to 2 feet 6 inches in length, by ½d to 3-5ths of a line thick.

The species I think to be the same as one previously described by me, under the name of the Robust Gordius (*G. robustus*), from a female specimen, about 6 inches in length, which was found parasitic in a Grasshopper (*Orchelimum gracile*), in New Jersey. Certain it is, the latter agrees in all details with the female specimens from Kansas, except in size. The great Helminthologist, Dr. Diesing, of Vienna, from my description, named the species *Gordius subspiralis*.

Although the complete history of the Gordius remains unknown, it is nevertheless clearly established that it passes a great part of its existence as a parasite in various species of insects. I have never had the good fortune to observe any of our species actually within, or proceeding from, insects, though I have, in a multitude of instances, seen the allied genus, Mermis, or White Hair-worm, within insects. A single specimen, from which I first described the Robust Gordius, was sent to me, together with a Grasshopper (*Orchelimum gracile*), which was said to have contained the worm.

The common European species (*Gordius aquaticus*, etc.) have been frequently observed within and proceeding from insects, which are there viewed as their natural habitation for the time, as much so as is the water subsequently. The names of various Beetles, especially the Ground-beetles, and also Grasshoppers, are given, which are infested with Gordii.

I have observed a White Hair-worm (*Mermis*) proceeding from the Carolina Grasshopper (*Œdipoda carolina*, Linn.), whilst the latter was struggling in a ditch into which it had jumped from being alarmed. Perhaps in this way we may account for the occasional appearance of a Gordius in a drinking trough, or a puddle on the road.

A brief notice of the structure of the Gordius may not be uninteresting in connection with the history of the animal. Notwithstanding the simplicity of its outward form, its organization is of complex character, and certain of its peculiarities are of special interest to the physiologist.

Though the Gordius has had the reputation of being able to bite, I must confess that I have not been able to satisfy myself that the animal actually possesses a mouth. For jaws I suspect the forks of the tail of the male have been mistaken. Some European observers have failed to detect the mouth, though Dr. George Meissner, of Göttingen, a most accurate investigator, both describes and figures it. Sometimes, and indeed generally, I have detected the appearance of a minute orifice, or pore, to one side of the summit of the head in the Variable Gordius, but in other instances and in other species, including the large Robust Gordius of Kansas, I could distinguish nothing of the kind, the head end appearing as smooth as a watch crystal, without the slightest sign of even a depression.

All reliable investigations, in addition to my own examinations, prove the total absence of anything like a stomach, intestinal canal and vent in Gordius. The interior of the body is occupied by a soft, white matter, reminding one of the pith of sassafras or other plant. This matter consists of polyhedral cells, resembling vegetable cellular tissue, and forms a continuous mass from one end of the body to the other. Spaces included in this cellular tissue are occupied by the genital and other organs. According to Dr. Meissner, the mouth opens into a short gullet which expands upon the upper end of the mass of cellular tissue.

Nutritive liquid matter imbibed by the mouth, or the thin investment of the head end of the animal, it is evident, can only pass throughout the body of the latter by endosmosis from cell to cell of the interior cellular structure. The arrangement of the latter, and the transmission of nutritive liquid, reminds one of the organization and passage of liquids through the rootlets of a plant.

Nothing like a system of blood-vessels, or nutritive tubes, nor like the tracheal air-vessels of insects, can be detected in the structure of the worm.

Whilst parasitic in insects, the Gordius is bathed in a rich and highly aerated nutritive material, and would thus not appear to require either an apparatus for the ingestion of food nor one for respiration. Perhaps, too, on account of the absence of a digestive and respiratory apparatus, when the Gordius first escapes from its abundant provision of "aerated bread," it is stimulated to incessant activity in the water to fulfill at least its respiratory need.

The generative apparatus of the female consists of a pair of ovaries, contained in the interior cellular tissue of the body, extending the greater part of the length of the latter on each side, and conjoining in a common receptacle below, which terminates at the genital pore. In the male the testes hold a similar relationship, and terminate in like manner.

Of other interior organs, there is a tubular gland extending through the axis of the body, and a cylindrical cord, apparently muscular, extending along the ventral side.

The nervous system consists mainly of a cord, without distinct or separate ganglia, extending along the ventral side, between the muscular cord just indicated and the general envelope of the body. In the head the nervous cord divides on each side of the muscular cord, and, according to Dr. Meissner, becomes continuous with a ring surrounding the gullet. No eyes or other organs of special sense appear to exist.

The external integument of the body consists of a thin cuticle of pavement-like cells, and a

thick dermis. This is composed of layers of fibres which pursue a spiral direction around the body of the worm, alternating or crossing in the successive layers. Within the thick skin of the worm there is a thicker muscular layer, composed of longitudinal fibres.

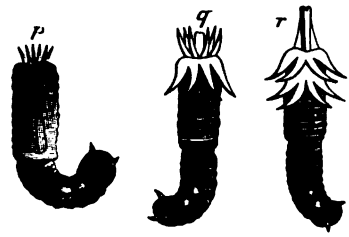
The Gordius is a wonderfully prolific animal. The mode of impregnation I have not observed. In the European *Gordius aquaticus*, Dr. Meissner observed that the tail end of the male wound spirally around that of the female, and by its forked extremity grasped that of the latter, while the genital pores were closely applied together.

The Variable Gordius and the Long-lobed Gordius extrude their eggs in a long, narrow white cord, from between the lobes of the tail, as represented in Figure 120, *h*. I observed a Variable Gordius, 9 inches in length by 2-5ths of a line in thickness, commence laying eggs, and continue the process very slowly and gradually during two weeks. They were extruded in a delicate cylindrical cord, resembling a thread of sewing cotton. At first it broke off, as extruded, in pieces about a foot in length, but, towards the end of the process, the cord appeared to be less tenacious, and broke off in pieces a few inches, and even a few lines, in length. The pieces in the aggregate measured 91 inches; the thickness of the cord was about the 1-10th of a line. The eggs are very minute, and in the cord were compressed together so as to be polyhedral. In a transverse section of the cord I counted about 70 eggs, and in the length of 1-40th of an inch 26 eggs, which by calculation gives 6,624,800 as the whole number of eggs in the cord. The eggs when isolated assume an oval shape, and measure about the 1-750th of an inch long by the 1-1000th of an inch broad.

The development of the young from the egg is readily observed from day to day; and it takes about a month before the process is completed. The globular mass of yolk in the centre of the egg undergoes segmentation, and increases in bulk until it is finally resolved into an oval mass of granules occupying the greater part of the interior of the egg. Gradually the mass assumes the appearance of a worm doubled upon itself, as seen in the magnified view (Fig. 120, *o*). In about four weeks the Gordius reaches maturity, and escapes from the egg totally different in appearance from the parent (Fig. 121, *p q r*).

The newly developed Gordius is about the 1-450th of an inch long. The body is constricted just posterior to the middle, so as to appear divided into two portions, reminding one of the two divisions of the body in spiders. The anterior thicker portion of the body is cylindrical, distinctly annulated, and contains a complex apparatus which the animal is capable of protruding and withdrawing. The posterior part of the body is cylindrical, annulated, and rounded at the extremity, which is furnished with a pair of minute hooks. The interior exhibits a faintly granular structure, including two large, clear, globular bodies.

[Fig. 121.]



The young Gordius appears not to be able to swim about, but lies at the bottom of the vessel containing it, slowly progressing through the alternate protrusion, reflection and retraction of the oral apparatus, and occasionally swinging the hinder part of the body from side to side.

The oral apparatus consists of a collar, with two circles of hooks, six in each, and a proboscis-like style. In the movements of this apparatus, the ends of six hooks are seen to protrude from the centre of the head (Fig. 121, *p*). These continue to project and diverge more and more, and then become reflected. As they turn backward the ends of the second circle of hooks are observed protruding in the same manner, and then follows the style (Fig. 121, *q*). When the latter is fully protruded, the first circle of hooks is seen at the margin of a collar deeply reflected at the side of the body, while the second circle of hooks is reflected from the margin of the head (Fig. 121, *r*). In a reverse order the different parts of the apparatus are retracted, to be again protruded in the manner described.

The newly developed Gordii, under my observation, continued to live about a week more, and then gradually died.

Dr. Meissner was successful in following the history of the animal a step further. Having placed in the same vessel with the young Gordii a number of larvæ of May-flies (*Ephemeridæ*), and Caddice-flies (*Phryganeidæ*), he observed that they entered these insects, and thus commenced their parasitic life. The worms were observed to penetrate the delicate membrane at the joints of the legs of the insects, and gradually to advance among the muscles and other organs throughout the body. In some of the insects as many as forty of the young Gordii

had penetrated. They afterwards became quiescent, doubled on themselves, and encysted, so as to resemble their former condition just before emerging from the egg. In this state they recall to mind the similar encysted Trichinæ in the muscles of man and the hog.

Dr. Meissner observed no further change in the Gordii, while contained in the insect larvæ, nor did he detect them after feeding some of the latter to water Beetles.

Thus from the young Gordius, which has escaped from the egg and entered upon its parasitic life in the interior of insect larvæ, to the parent Gordius, as it is commonly observed, either as a parasite or living in the water, the circle of the animal's history is broken and unknown.

Perhaps the young Gordii remain quiescent in the May and Caddice-flies until these undergo their last transformation in the air, when they may be seized and devoured by Ground-beetles, which are ever lurking beneath stones and other objects in the vicinity of water, on the lookout for prey. Once eaten by the Beetles, like Trichinæ swallowed by the hog, the Gordii may then undergo transformation, and assume the form of the parent Gordius, which is said especially to infest the Ground-beetles.

EXPLANATION OF FIGURES, ALL OF WHICH ARE MAGNIFIED.

FIG. 119.—*a*. anterior extremity of the female Variable Gordius (*G. varius*); *b*, the same of the male; *c*, anterior extremity of the Linear Gordius (*G. linearis*); *d*, side view of the posterior extremity of the male of the same species; *e*, anterior extremity of the Robust Gordius (*G. robustus*), from Kansas; *f*, posterior extremity of the female of the same species, exhibiting the genital pore.

FIG. 120.—*g*, Posterior, tri-lobed extremity of the female Variable Gordius; *h*, the same, with the lobes more divergent, and exhibiting the extrusion of the cord of eggs; *i*, posterior bi-lobed extremity of the male Variable Gordius, seen on the ventral surface, and exhibiting the genital pore; *k*, dorsal view of the same; *l*, posterior bi-lobed extremity of the male Long-lobed Gordius, seen on the ventral surface, and exhibiting the genital pore; *m*, the same in the male of the Linear Gordius; *n*, portion of the fringe of the latter, highly magnified; *o*, egg of the Variable Gordius, containing a fully developed worm, highly magnified.

FIG. 121.—The young Variable Gordius, after escaping from the egg, highly magnified; *p*, the worm commencing to protrude the oral apparatus; *q*, the first circle of hooklets bordering the collar reflected, and the protrusion of the second circle of hooklets and the style; *r*, complete protrusion of both circles of the hooklets and style.

ONE DAY'S JOURNAL OF A STATE ENTOMOLOGIST.

[This is one of Mr. Walsh's posthumous papers. The duties therein defined may be considered light, as will readily be imagined, when the number of letters received each day swells to fifteen or twenty, instead of six or seven, as we often find to be the case during the height of the summer season.—ED.]

Many persons have an idea that the office of State Entomologist is a snug little sinecure, such as the footman was in search of when he told the gentleman who proposed to hire him that he wanted a place where the wages were high, and where there was very little work to be done, except kissing the housemaid. We propose, for the enlightenment of persons like these, to give, in the following paragraphs, a sketch of an average day's work, such as the Bugmaster General of Illinois, or the State Entomologist of Missouri, has to perform almost every day during the greater part of the year.

5 A. M.—Rose and went over to the office. Examined my breeding-cages; found the leaves beginning to wilt in five of them, in two of which I had larvæ feeding on oak leaves, while the larvæ in the remaining three lived respectively upon hickory, plum and basswood. Took my cane and hat, and started out to get a supply of fresh leaves. Had to walk a distance of a mile and a half, because there was no basswood growing any nearer to my office. Returned and shifted the larvæ on to fresh twigs, placed, as usual, in water to keep them fresh as long as possible. Noted in my journal how many larvæ in each cage had gone to pupa, and how many had died or disappeared from other causes.

7 A. M.—After breakfast, and while I was smoking my usual cigar, examined my breeding-jars, and the cages where I keep my pupæ. Found that seven moths had come out. Noted in my journal the lot of pupæ from which each of the seven had come out, so as to connect each separate species with its larval history. Killed the moths, and set out their wings in my drying-box. Before I could do this—as all the trays in the drying-box were brimming full—had to remove the setting-pins and setting-braces from a whole tray, and distribute the dried insects among the appropriate store-boxes, each group in a separate store-box along with the labels that belong to each species, and indicate its name and history as far as ascertained. Found that, in my breeding-vases, I had reared three species of insects that were quite new to me. Ascertained at once the name of two of them; but, after spending two hours in referring to a dozen different authors, to find out the name of the third, am more in the dark than ever. Surely this must be a new and hitherto undescribed species. If so—but I must see about that to-night.

11 A. M.—Run up to the post-office for my morning mail. Find there four letters from correspondents, enclosing specimens of bugs, and requesting an immediate answer, two such letters to be answered through the ENTOMOLOGIST, and a package of proof-sheets from R. P. Studley & Co., St. Louis; also, a lot of political

and agricultural journals. Return home in a hurry, pitch the printed journals into the basket, to be examined when I have a little leisure, and answer per mail the four letters that require immediate attention. Luckily the insects sent with these four letters are all common species, and perfectly familiar to me; and, as I know them "like a book," it does not take me long to write my four letters.

12:30 P. M.—After dinner, and while I am luxuriating in a fragrant Havana, revise the proof-sheets. Find but very little indeed to correct. Have had proof-sheets from a dozen different printing offices in America, and from twice that number in England, and never yet met with such "clean" proofs as Messrs. Studley & Co. turn out from their magnificent establishment. Open the two letters, enclosing specimens of bugs, and requiring to be answered in the ENTOMOLOGIST. One of them is all plain sailing, as the insects are well known to me, and are properly packed with some cotton wool in a little stout pasteboard box. The other correspondent has enclosed his specimens loose in his letter, and being soft, fleshy larvæ they are squashed into a most promiscuous mass. Puzzle a long time over the head, which is the only recognizable part. Conclude that it probably belongs to some one or other out of fifteen distinct larvæ. Puzzle again for half an hour longer to *guess* which larva of the fifteen is the one that has been sent me. Alas! I am no Yankee, and have finally to give the job up in despair. Write the appropriate "Answers to Correspondents," and fully expect to be "cussed" considerably by one of them, because I cannot distinguish every one of the thirty thousand species of insects that exist in the United States by a fragmentary specimen of its head.

4 P. M.—Go into my garden to examine the results of several experiments that I am trying as to the efficacy of different chemical preparations upon several different noxious insects. Return and record the results, so far as they appear up to this day, in my journal. Walk out with my fly-net, and capture two males and one female of a rare insect, which is comparatively common here, and of which I have promised to send specimens to an Eastern correspondent, in return for his kind assistance in making extracts for my use from scarce and expensive Entomological works, which at present are only to be found in the great scientific libraries in the Eastern cities. Heigho! I wonder if we shall ever get a public library in the West that is decently supplied with standard works on Natural History. I wish I was a rich man; would not I then send an order forthwith to Europe for $10,000 worth of Entomological books!

6:30 P. M.—Have just returned from the post-office and swallowed my supper. I have received two more letters on the great Bug question, that require immediate attention; and a long and most interesting letter from an entomological correspondent in Europe. Run my eye over the last, and find my modesty terribly shocked by his telling me that the ENTOMOLOGIST is highly appreciated among scientific men on the other side of the Atlantic. Answer the other two letters, one of which contains some new and most important facts about a certain noxious insect, which throw great light upon a point in its history that has hitherto been wrapped in obscurity. What an accurate observer that last correspondent of mine is! I would just as soon trust his eyes—as to the operations of any particular bug—as I would my own! But then, of course, I know the correct names of the different bugs better than he does. If I had but one hundred such correspondents, they would be as useful to me in my scientific investigations as fifty pairs of additional eyes! And yet this man is nothing but an intelligent fruit-grower, with good, strong common sense, and that most invaluable habit of never seeing anything until he does actually see it.

8 P. M.—Having now discharged the duties of the day, I am just about to sit down to prosecute some further investigations into the correct name and classification of that bug that bothered me so much in the morning, when I hear a tremendous fluttering in one of my breeding-cages. Lo and behold! There are two large moths come out that I did not expect to make their appearance for a week or two. Chloroform them to stop their fluttering; and, after killing them and stuffing their abdomens with cotton, set out their wings on the little space that remains in the tray that I cleared in the morning. To-morrow, I suppose, I shall be obliged to clear another tray. Well—"Sufficient unto the day is the labor thereof."

9 P. M.—Set to work once more to puzzle over my supposed new species. Can find no description to suit it in any work that I possess. Can it be really a new species? As usually happens in such cases, there are several species belonging to the genus, the descriptions of which are only to be met with in certain rare and expensive works which I am not rich enough to buy. What shall I do? I have it! I will enclose some specimens, so securely packed that they can not possibly come to any harm, in a letter to one of

my correspondents in the East, who has the happiness to have access to the very best scientific library in the whole country. At my request he will, I know, compare the specimens sent with the descriptions to which he has free access every day, while I should have to travel a thousand miles to get to them. I do this; and now, having done my best, I will calmly and peacefully await results. But by this time it is 10 P. M., and I am beginning to feel sleepy and tired. Suppose I adjourn to the county of Bedford?

HOW TO COLLECT AND STUDY INSECTS—No. 2.

BY F. G. SANBORN, BOSTON, MASS.

One can scarcely walk a mile in the country without obtaining some object to grace his cabinet, or observing some fact in natural history to add to his store-house of mental treasures. It should be borne in mind by the student collector that, notwithstanding he may propose to confine his studies to one Order of insects, he should also contract a habit of observing and collecting those of other Orders, as well as such small and portable vertebrates and other invertebrates as his opportunities may enable him to capture and preserve. Alcoholic specimens of Mammals, Birds, Fishes, Reptiles, Mollusks, Crustacea, and facts concerning them, are marketable commodities in the Exchanges of Science. Especially should this plan be carried out by the collector who may be established for a term of months or years in a region remote from libraries and museums. Such study and investigation in this field as his time permits, will of itself materially enlighten his mind upon the secrets of Nature; and, although destitute of books—those records of repeated failures and few successful attempts to unmask Nature's protean face—he may learn the structure, habits and comparative intelligence of the creatures around him. A subsequent opportunity may occur for him to ascertain, if so disposed, the different technical names imposed upon "Mouse No. 7," "Bird and nest, XII," or "Bug No. 427," and accepted by the scientific world.

[Fig. 122.]

Should he care only to acquaint himself with the nomenclature of some limited group or order, and wish to increase his cabinet in that specialty, he will find that he has the powers of a capitalist to invest his miscellaneous collection of specimens and facts in such manner as he may prefer. Thanks to the diversity of tastes implanted in us, there is always some eager specialist—individual, or backed by an association—standing ready to give full value for, and "work up," this or that portion of such material.

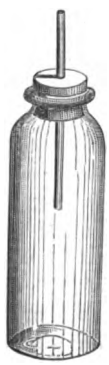
The practice of noting (with *ink* if possible) in a small blank book, or on cards, such facts and observations as he may make or discover, adds immensely to the value of any collection, and can not be too strongly recommended to the collector. The date of capture of a specimen, of the transformation from the egg, larva or pupa, of the appearance or disappearance from its usual haunts, and such other items of interest that arise in connection with the specimen, are of importance to the student, and should be therein set down. A small tag or ticket of paper attached to the dry specimen, or of parchment, leather, or soft metal to the alcoholic, and bearing a number corresponding to that in the note-book, renders the information thus obtained available, and sufficiently identifies the specimen. As the collector pursues his investigations month after month, he will find his senses becoming educated to a delicacy of touch and fineness of perception that can not fail to be a source of pride and gratification to him. He whose attention would not at first be diverted to the ragged leaves of a caterpillar-ridden tree, will in a few months notice instantly the slight convexity of outline on twig or leaf caused by the presence of a small insect, or the extremity of a branch cleanly cut by a Pruner-beetle.

In the course of his observations he will be amused by the imitative shapes and colors of many forms of insect life, and will frequently be deceived by the Curculios, who successfully simulate buds and bits of bark. The caterpillars of some of the moths resemble so closely cylindrical twigs, as many of the Loopers (*Geometridæ*); scales of rough or smooth bark, as the Hag-moth (*Limacodes pithecium*), and the Lappet-moths (*Gastropacha velleda* and *americana*). Some of the Beetles, as the *Cryptocephali* and *Histers*, closely resemble seeds, as do certain Bugs, among them *Corimelaena*, and the two latter suggest such kinship as to cause them almost invariably to fraternize in the cabinet of

the amateur. These singular resemblances are called mimetic forms; and, existing everywhere in Nature, even if they have no high significance and serve no better purpose, educate our perceptive powers to a degree undreamed of by the careless horde of money worshippers.

During the active season of the insect year the collector should make it a rule never to stir abroad without a cork-stoppered vial half filled with alcohol, for the temporary deposit of beetles, ants, or the larvæ or pupæ of any insects that it may be desirable to preserve in this way. The only insects that are irrecoverably injured by a few days immersion in pure alcohol are the Butterflies and Moths. For these a small cork or pith-lined pocket box, of convenient form and full one inch and a half in depth, containing a few insect pins of various sizes, is indispensable, and should be a constant companion. Upon a premeditated excursion of a day or more in duration, the collector will naturally provide more extensive means of transportation, such as jars of alcohol, a vial of chloroform, a number of old envelopes, and a larger box slung on the side with straps, and a proportionate stock of pins. Some collectors continually carry, in a pocket made for the purpose, a wide-mouthed vial like a chemist's test-tube, "of the same size all the way up," containing at the bottom a few grains of cyanide of potassium, which is kept in place by a wad of cotton, felt or thick cloth, neatly pressed down upon it. (See Fig. 122.) This prevents the cyanide, which is a deadly poison, from touching or soiling any delicate insect, and allows the powerful vapor to destroy, as it does almost instantly, the life of any insect that may be enclosed in the prepared vial. The permanence of this poison (its virtue enduring for a twelvemonth or more), its cleanliness and cheapness, render it perhaps the most convenient and desirable "life-annihilator." It is, perhaps, unnecessary to mention that the vial should be kept tightly corked, and that the insect should remain therein not much more or less than ten minutes. A vial one inch in diameter and four in length, made of strong glass, is the most desirable size. Some collectors carry a small vial of chloroform, through the cork of which passes a very small tube of metal; what is called by jewellers "hollow wire," of minute aperture, is used for this purpose. (See Fig. 123.) This instrument is used for conveying a limited quantity of chloroform to the spiracles of the insect, without deluging and damaging much of its plumage, if furnished therewith. Ether, as well as chloroform, is sometimes used in lieu of the cyanide, but it has to be continually supplied from another reservoir. In some countries bruised laurel leaves are placed in the bottom of the vial, or a small packet of them pinned in a corner of the collecting-box, enclosed in a little bag or wisp of loosely woven cloth, such as lace, book-muslin, &c. All of these poisons act at first only as anæsthetics, or stupefiers, and should be continued in use sufficiently long to destroy vitality, or to prevent the struggles of the insect; for by these struggles it injures itself, as well as its companions, after being pinned in the collecting box.

[Fig. 123.]



NOTES AND EXPERIMENTS ON CURRANT WORMS.

BY W. SAUNDERS, LONDON, ONT.

The larva of *Nematus ventricosus*, alas, too well known under the popular designation of "currant worm," has been very abundant in this neighborhood during the present season. In my own garden it has been a continual fight as to who should have the currant and gooseberry bushes, the worms or their rightful owner. During the early part of summer, anticipating their attack, I was on the lookout for them and by timely doses of hellebore preserved the foliage with but little damage. In about a fortnight later, having omitted inspection for a few days, I was surprised to find the bushes being stripped again; and this time the enemy had got so far ahead as to damage their appearance considerably. Another prompt dosing of hellebore brought relief. After this I hardly ever found all the bushes entirely free from them; a walk around the garden would reveal a few here and a few there, and I was perpetually hand-killing and brushing off these smaller detachments. Four times during the season I found it necessary to apply hellebore freely, for the foes were a legion.

During the middle of August, being occupied with other matters, the garden was neglected for a few days, when on visiting it again on the 19th, I found many of the bushes entirely leafless, and the foliage remaining on the others was rapidly disappearing. I felt discouraged and began to have some misgiving as to whether hellebore was after all such an unfailing panacea for this almost universal pest as we had supposed. I resolved if possible to satisfy myself fully on this point, and having mixed about 1½

oz. of powdered hellebore with a pail of water, was ready to proceed. I selected a leaf from two bushes, marked them and counted the number of their inhabitants—one was occupied by *forty-four* worms of different sizes, crowding it above and below, and it was about half eaten; the other leaf had twelve nearly full grown on it. Having transferred the mixture of hellebore and water to a watering pot, the bushes were sprinkled with it. I returned to examine the results in three-quarters of an hour, and the leaf which at first had forty-four on it, had now only two, and these were so far exhausted that they were unable to eat, and could hardly crawl, while on the other leaf out of the twelve there remained three, but in the same enfeebled condition. All around under the bushes, the ground was strewed with the fallen foe, and I felt perfectly satisfied that entire reliance might be placed on this means of defense.

I did not anticipate such speedy action on the part of the hellebore, or should have returned to the examination sooner, and the bushes were so entirely cleared, that excepting on one I had reserved for another experiment, I had no means of repeating the dose.

There was one thing that struck me as somewhat remarkable, the portion of leaf on which the greatest number were feeding, appeared to be of the same size as before the hellebore was applied; if smaller I could not perceive it. When the leaves dry, which have been sprinkled with liquid, a very thin coating of the powder, more or less regular, is found over them, and I had always supposed that death resulted from eating a portion of the leaf thus coated. Such is undoubtedly the case when the hellebore is applied dry, but in this case a meal however small made by *forty-four caterpillars* on half a leaf, must have materially diminished it. I am disposed to believe then that the death of most of these must have resulted from their imbibing or absorbing some of the liquid as soon as applied. Many of them showed symptoms of the violent cathartic action of the remedy, having a mass of soft excrement hanging to the extremity of their dead bodies.

I had reserved one bush, on which were a good number, for another experiment. It sometimes happens, especially with those who live in the country, that hellebore is not at hand when the worms are first observed at work, and a few days' delay in procuring it is perhaps unavoidable. In such cases the bushes may be entirely leafless, before the remedy can be applied. Hot water suggested itself to my mind as likely to be of some service, and being also an article readily procurable in every home. It is well known that many plants will bear such an application without injury, provided the heat is not too great. Taking some in a watering pot, a little hotter than one could bear the hand in, I showered it plentifully on the affected bush, and it was amusing to see how the caterpillars wriggled and twisted and quickly letting go their hold, fell to the ground, which was soon strewed with them. After the first excitement produced by the sudden heat was over, they remained as if wishing to "cool off" before commencing work again. A few did not recover from the application, but most of them were soon as active as ever.

Now what I would suggest is this, that where the hellebore cannot be at once procured, no time should be lost in applying the hot water, and when once on the ground the creatures may have the life trodden out of them by the foot, or beaten out with the spade or some other implement. In any case many of them would never reach the bush again, for enemies beset them on every side. I was amused to see how busy a colony of ants were which had a home at the base of a tree near by, lugging these large caterpillars along, a single one of which would take three or four to manage. The worms were twisting and jumping about as if they wondered whose hands they had got into, and the ants were hanging on with their sharp jaws and slowly dragging the bodies along. By and by they had quite a little pile accumulated, which would no doubt furnish them or their progeny with a feast of fat things for some time to come. Then there are the tiger beetles (*Cicindelidæ*), with a host of others ever running about, looking for stray objects of this sort on which to make a dainty meal.

I had observed on one of the bushes, before applying the hellebore, some friends at work on these worms. They were immature specimens of a true bug belonging to the order *Hemiptera*, and probably the young of *Stiretus fimbriatus*. These creatures are nearly round, about the size of a common ladybird, having the head, thorax and legs black, and the abdomen red with an elongated black spot in the center, divided across by a whitish line. Approaching a caterpillar, they thrust their proboscis into it and quietly suck its juices until it becomes so weak and exhausted that it shrivels up and dies. With the view of testing the probable amount of good these friends were thus capable of accomplishing, I shut up two of them in a small box, with a dozen nearly full grown caterpillars, and at the end of three days found that they had consumed them all; also six in another box with one bug,

and in this instance the rate of consumption was about the same, two caterpillars a day for each of these little creatures. The second time I fed them they did not get though their work quite so quickly; possibly they may have overfed themselves at first.

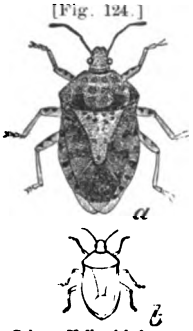
While turning up the branches of some of my gooseberry bushes, I observed a number of whitish eggs on some of the leaves, arranged lengthwise in regular rows at short distances apart, on the principal veins or ribs of the leaf. Usually they were placed singly in the rows, but here and there double. These were the eggs of the currant worm, they were about one twentieth of an inch long, four times as long as broad, rounded at each end with a whitish glossy surface. On the branch I was examining there were three leaves with these eggs on; two of them had their principal veins pretty well covered, while the third had but a few on it, as if this had been the work of a single insect which had exhausted her stock before the third leaf was covered. I counted these, and found there were 101 in all. Having just then caught one of the parent flies, a female which was hovering about as if looking for a place on which to deposit her eggs, I squeezed some eggs out of her body and comparing them with those on the leaf, found they were only about half the size, showing that the first must have grown considerably after being laid and that they were probably nearly ready to hatch. In about three hours afterwards, I observed that several of the young larvæ had come out of the eggs, and placing the leaf under a microscope had the good fortune to see some of them escape. The egg consisted of a thin elastic membrane sufficiently transparent to give a dim view of the enclosed larva. The black spot which is placed on each side of the head in this species, enabled me to determine the position the creature occupied. It was somewhat coiled up and resting on its side with its jaws against the side of the egg not far from its extremity. I could not perceive that it had any other means of rupturing the egg than by its mandibles, which were working visibly within. In a short time the egg was ruptured and the head of the larva protruded from the orifice. Withdrawing its two front feet from the egg, it seized the leaf on which it was placed, and by raising up its back and working itself from side to side, it soon worked itself out. The time occupied in thus extracting itself, from the first appearance of the head, varied from six to ten minutes, for I watched several of them through the process. The egg was so thin and elastic that it yielded readily to the motions of the body, and adhered very closely to it, contracting and shrivelling up as the body was withdrawn.

After the larva comes out it does not consume the egg or any portion of it, as is the case with most *Lepidoptera*, but sets to work at once eating the leaf on which its considerate mother placed it. When just hatched the worms are about one-twelfth of an inch long; head large, dull whitish with a round dark spot on each side, and a few minute short hairs; mandibles pale brown. Body above and below whitish, semi-transparent, sometimes with a slight greenish tinge. From this time it rapidly increases in size, becoming green then changing to green with many black dots, and finally reverting to pale green again, tinged with yellow at the extremities, just before it becomes a chrysalis.

I have a fact to communicate regarding the winter history of this insect. It has been universally held, that the larvæ, when they leave the bushes in the fall, at once construct their cocoons, either at the surface of the ground or just below the surface, and change to pupæ either then or sometime before early spring. Possibly as a rule this may be the case, if so I have an interesting exception to record. On the 22nd of May I was trying some experiments in crossing gooseberries, fertilizing the flowers of the Houghton's Seedling with some of the large English varieties, and having operated on several branches, tied them up in new paper bags to prevent interference with the work, either from insects or otherwise. The particular bag I am about to refer to, was attached to an upright branch on the summit of the bush, about eighteen inches from the ground. While examining it on May 31st, nine days afterwards, to ascertain the result of my work, I found in one of the folds of the bag a cocoon of *Nemantus ventricosus* firmly attached to the paper. In this instance the larva must have remained unchanged during the winter, then crawled from the ground, attaching itself as related and constructing its cocoon after the 22d of May. A few days later, I found a similar cocoon attached to the bush, which from its fresh appearance I inferred had been constructed about the same time, although I am unable to advance any positive statement regarding it. During the summer I have found a considerable number of such cocoons fastened to the underside of the leaves of the bushes on which the larvæ have been feeding, and these have been observed in all positions from near the base to the summit of the bushes, showing that it is not the invariable practice of the larva to undergo its change to chrysalis, either at the surface or under the surface of the ground.

[We copy the above interesting observations from the *Canadian Entomologist*, as an addition to the article published in the first number of our present volume. The Half-winged Bug spoken of on page 201, which so savagely attacks the Saw-fly larvæ, has never yet been described. We paid Mr. Saunders a visit, at the time these Bugs were in the larva state, and have since received two specimens of the perfect insect. From these, we are enabled to publish the following description through the kindness of Mr. P. R. Uhler, of Baltimore, who has sent us an advance copy from a paper which is now going through the press of the Smithsonian Institution at Washington. Our Figure 124, *a* giving a magnified view, and *b* showing the natural size, will enable the practical reader to recognize this friend, and if he should ever notice it upon his worm-infested currant or gooseberry bushes, let him carefully pick it off temporarily, and after the leaf-eating worms have been subjected to a shower of hellebore-water, or a blast of the dry and powdered article, let him tenderly replace it upon the bush, that it may slay the last one, of the injurious army, which may have escaped the avenging storm.—Ed.]

[Fig. 124.]



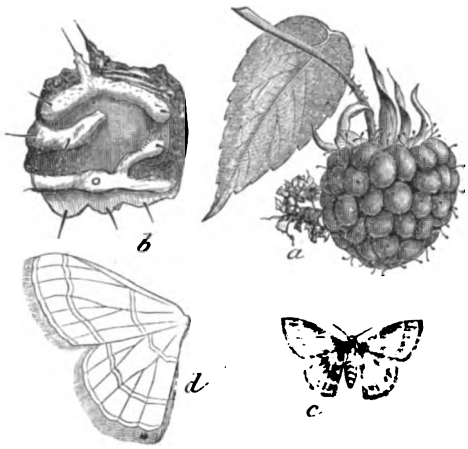
Colors—Yellowish-brown and dark-brown.

Podisus placidus, Uhler.—Ovate, luteus. Head truncated in front, the lateral margins slightly sinuate, black, recurved; each side of tylus a blackish, or brown, streak; a similar streak runs from behind each of the ocelli and curves towards the eyes, and sometimes coalesces with that on the tylus; the surface coarsely, remotely punctured; ocelli red; tylus smooth and cylindrical to near the tip, the tip depressed. Antennæ yellow, tinged with rufous, the middle, almost to each end, of all the joints infuscated above; basal joint not reaching the tip of the head; second joint subequal to the third and fourth united; remaining joints much stouter than the second; fourth and fifth subequal. Rostrum reaching to the venter; the basal joint shorter than the head. Pronotum short, the surface anteriorly rugose, coarsely, in patches aggregately, punctured with purple; the posterior division more or less suffused with purple; each side of callosities with a black dot; middle line smooth, yellow; humeral angles prominent, blunt, the lateral margins smooth, yellow, anteriorly obsoletely serrated. Underside and legs yellow; a series of small black dots extends from behind the eyes to the penultimate ventral segment; tips of tibiæ, and tarsi, more or less infuscated or suffused with rufous. Scutellum clouded with purple, the middle line and tip remotely punctured, more distinctly yellow; the base with a few bare dots, the surface generally closely punctured. Hemelytra purplish, closely, more finely punctured, the exterior margin and principal suture yellow; membrane embrowned. Length 10 millims. Humeral breadth 5½ millims. Inhabits Canada, Washington Territory, and Massachusetts.

To our Subscribers in Canada.—Parties in Canada, who wish to subscribe for the American Entomologist, can obtain it, postage free, by remitting $2.00 to the Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.

MY RASPBERRY AND VERBENA MOTHS, AND WHAT CAME OF THEM.

[Fig. 125.]



Colors—(*a* and *b*) yellowish-gray; (*c* and *d*) verdigris-green.

Readers of the American Entomologist, listen to my story, and give me your sympathies. Upon two occasions I have bred two beautiful little moths. One I called the Raspberry Moth, as the little caterpillars fed upon the leaves and fruit of the Raspberry; the other I called my Verbena Moth, as the larva fed upon the buds and flowers of the Verbena.

I hunted through all the works on Entomology I had access to, and could find no description of these moths; and I began to flatter myself that I really had found two new species. So I studied them carefully, took notes of all their wonderful ways, and spent much valuable time in watching their proceedings.

I found my little raspberry caterpillars had a decided preference for the Philadelphia Raspberry, though I occasionally found them upon the Black-caps. They also seemed to have a great passion for ornaments, for they had stuck all over their bodies dried anthers of flowers and small bits of sticks and leaves, which gave them a very comical and grotesque appearance.

I confined several of these larvæ in a box, giving them daily a fresh supply of raspberries, and they seemed to thrive as well in confinement as in the open air. Knowing their fondness for ornaments, I could not deprive them of these; so I cut white paper and thread, together with leaves, into small bits, and distributed them in the box. Very soon they were decked out in these, the white paper and thread adding materially to their grotesque appearance. Not always satisfied with their own accumulations, they would sometimes take the ornaments from their neighbors and appropriate to their own use.

I once left the cover to the box not quite secure, and one of them made its escape, completely stripped of its ornaments; it had left all in the box behind, in squeezing through the aperture. I no sooner returned it to the box than it began to take the ornaments from its comrades to re-adorn itself, rather than to pick up its own, a process which those that were being stolen from did not seem at all to relish.

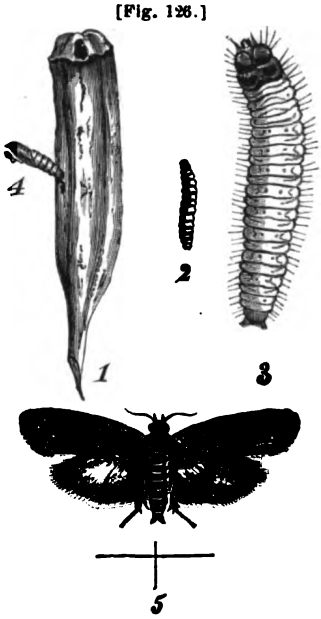
After they ceased eating and were ready to become pupæ, they spun loose cocoons, which they fastened to the top and sides of the box, taking their ornaments to decorate their cocoons, which, in consequence, wore a very rough, uneven appearance. In a few days, a little pea-green moth issued from these rough cocoons—the most delicate, beautiful little creature imaginable.

I now submitted it to the late Mr. Walsh, and received this reply: "Your Raspberry Moth is *Aplodes rubivora* of the Junior Editor, first described in his Missouri Report."

Down went all my air-castles of being immortalized in science with this delicate little creature!

I now had the Verbena Moth (Fig. 126, 5) to build my hopes upon. Although not so interesting as the other, still it was very pretty; and as my interest in the Raspberry Moth had greatly subsided, since I found that it had a name, and more than a "local habitation," so my regard for the Verbena Moth as greatly increased, notwithstanding it was such a terrible nuisance in the larva state. It seemed determined not to let us have a perfect verbena blossom. Quite early in the season I first noticed its work. The larvæ were so small, and so near the color of the calyx of the flower, that it was almost impossible to catch the perpetrator until the mischief was done. They were hid away among the clusters of buds, and ate through the lower part of the calyx, completely destroying the flowers. At first they seemed to be mostly confined to the white and light-colored varieties of verbena, but later in the season they attacked all colors indiscriminately.

[Fig. 126.]



Colors—(2 and 3) dirty flesh-color, inclining to green; (5) silvery-gray and brown.

I also noticed that the pupæ were affected by lamp-light, a peculiarity that I had never observed in any other insect. One evening I brought several clusters of verbena buds, that were badly mutilated by these little pests, to the light of a lamp, which affected the pupæ so much that they worked and wriggled themselves entirely out of their cocoons; and I waited in vain to see them give forth the perfect insect, which, however, did not issue until two or three days after this.

After satisfying myself that this insect was not described in any work on the *Lepidoptera*, I sent it to Mr. Walsh, and he inclined to believe that it was a new and undescribed species; but added, he would let me know in due time. So it was left until after the death of Mr. Walsh, when Mr. Riley came across some of the moths I had sent to Mr. Walsh, and wrote: "Your Verbena Moth is my *Penthina Fullerea*. You will find it figured and described in *Tilton's Journal of Horticulture* for October, 1868. My hopes blighted again!

With a great feeling of disappointment I went to hunting among Tilton's old journals until I found the designated number; when, Lo! here it was figured as natural as life, with a full description of it in all its stages. From the account here given it would seem to like a greater variety of diet than Mr. Riley had supposed, although he had given it considerable latitude; but the Verbena is a long way from the Iris and Lily families.

As what I found in *Tilton's Journal* bears upon the name of this moth, and upon its food-plant as noticed by Mr. Fuller, and as it is also the first published account of this insect, I hope Mr. Riley will allow me to quote, in part, his letter to Mr. Fuller:

"The Tigridia-seed larvæ which you sent me last December have proved, as I suspected they might, to be an entirely new species. Ever since the 10th of March, I have been breeding from them a pretty little moth, belonging to the genus *Penthina*, and inclose, in accordance with your request, a brief description of the worm, its chrysalis and moth, together with some drawings, which will be of more value to you.

"The genus *Penthina* belongs to a sub-family of the *Tortricidæ* (a large group, whose larvæ live for the most part in seeds, buds, or between leaves, which they fasten with their silken threads); and it is characterized by the antennæ

of the moths being simple; their upper wings being twice as long as broad, and arching in front from the shoulder; and by a tufted thorax. They rest with the wings in the shape of a roof, but rounded above, and somewhat approaching each other beyond the body. The sexes differ but slightly.

"It is quite probable that this species is not confined to the Tigridia, but will be found to attack the whole lily family, or at least the *Iridaceæ;* and I name it, therefore, in honor of yourself." MRS. MARY TREAT.

VINELAND, N. J., April, 1870.

[For the benefit of the scientific reader, we annex descriptions of these two insects in their different stages:

THE RASPBERRY GEOMETER (*Aplodes rubivora*, Riley.)—*Larva*—Average length 0.80 inch; 10-legged. Color yellowish gray, very minutely shagreened all over, and with other warty prominences as at Figure 125 *b*. Each joint with a prominent, pointed, straight projecti on each side of dorsum, and several minor prickles below. Two very slightly raised, longitudinal, light-colored lines along dorsum, between the prominent prickles. Feeds on the fruit and leaves of the Raspberry, and disguises itself by attaching to its prickles, and especially to the dorsal ones, pieces of dried berry, seed, pollen, anthers, and other *debris* of the fruit. These foreign substances are fastened to the prickles by aid of the mouth, from which a viscid silky matter is emitted for the purpose.

Pupa.—Length 0.25 inch. Formed within a slight cocoon. Pale yellow, inclining to flesh-color, with a darker dorsal line, a row of dark spots each side, and with longitudinal dark lines on wing-sheaths and antennæ; two slight projections anteriorly just above the eyes. Appears minutely speckled under lens.

Perfect Insect.—Alar expanse 0.50 inch, length of body 0.25 inch. Color verdigris-green, the scales being sparse and sprinkled over a light ground, so that the winge, when the least rubbed, appear sub-hyaline. *Head* short, fulvous; eyes inclining to green, with a deeper border; palpi pale; antennæ scarcely reaching to inner transverse line of front wing, white and convex above, fulvous and concave beneath; stout at base (where they are connected by a white transverse piece) and tapering to a fine point; those of the male fringed, those of the female simple. *Thorax* green on a fulvous ground. *Abdomen* slightly green on a fulvous ground, and with a whitish spot above, at base. *Front-wings* with two transverse light lines dividing the wing into three parts, proportionate, on costa, as 3, 4, 2 counting from base; the outer line scarcely sinuate and nearly parallel with posterior margin, being a little produced posteriorly between nerves 2 and 4; the inner line more decidedly sinuate and reaching the costa and inner margin at about the same distance from base; costa broadly white about the middle; posterior margin with a fine white line; fringes green: under surface silvery, with a tinge of green and with the transverse lines barely indicated. *Hind-wings* with two similar transverse lines, dividing the wing in like proportion, the outer line produced posteriorly between nerves 2 and 3; posterior border and fringe as in front-wings; under surface uniformly silvery-white, the lines barely indicated in certain lights. *Legs* short, the thighs of the first four inclining to green and their shanks to fulvous. Described from 2 ♂ and 3 ♀ bred specimens, in two of which there is, on front-wings, a faint line running to about one-third of wing from costa, between the two transverse lines.

This species resembles the *glaucaria* of Guenee, but is evidently distinct, if we are to judge from his description. We have another very closely allied species in this country, and one which is more common than *rubivora*. It may be known as the Yellow-lined Geometer (*Aplodes flavilineata*), and it may be at once distinguished from *rubivora* by its somewhat larger size, by the transverse lines being broader, *yellow* or *fulvous* instead of white, and dividing the wings into three more nearly equal parts; by the outer lines running almost straight across both wings; by the inner ones on the front wings being much arcuated towards base near the costa, and on the hind wings being sub-obsolete; and lastly by the broad yellow costal and posterior border. The larva of this species has been found by Mr. P. S. Sprague, of Boston, Mass., feeding on the flowers of some composite plant, and it is furnished with similar spines and has the same habit of disguising itself as that of *rubivora*. These are the only two North American Geometers, the larvæ of which are known to be furnished with such spines; though that of *Hipparchiscus venustus*, Walsh, has *curled* lateral velvety appendages,* and that of *Nematocampa filamentaria*, Guen., has two pairs of long curled filaments on joints 6 and 8.†

Our Figure 125 represents the larva of *rubivora*, natural size at *a;* an enlarged lateral view of a segment at *b;* the moth natural size at *c* (the second half-line on hind wings is a mistake of the engraver), and an enlarged outline of the wings at *d* (the posterior line on hind wings is not sufficiently produced behind, between nerves 2 and 3).

THE VERBENA BUD-MOTH—*Penthina Fullerea*, Riley.—*Larva*.—Average length 0.50 inch. General color of a uniform dull carneous, frequently inclining to yellow and to green; two wrinkles on each joint, head jet-black, without a spot or shade; cervical shield also black, and occupying the whole upper surface of joint 1; piliferous spots in the normal position, but scarcely observable, even with a lens, except by the hairs proceeding from them; thoracic, abdominal and anal legs, and venter, of the same color as upper surface.

Pupa.—Average length 0.25 inch; of the usual form, with a distinct row of teeth above, on the anterior portion of each segment, and a few minute bristles at the extremity and along the sides Formed within a silken cocoon, constructed within the seed or bud which the larva inhabits: it forces itself half way out at one side, when the moth is about to emerge.

Perfect Insect.—Alar expanse 0.50 inch; length 0.23 inch. *Head*, with buff-brown tufts; eyes and palpi at tips somewhat darker; antennæ short (one-third length of front-wing), filiform and simple in both sexes. *Thorax* with the shoulder pieces and dorsal tuft of the same buff-brown. *Abdomen* more gray. *Front wings*, ground-color silvery-gray, with metallic blue reflections more or less intense; the lighter parts flesh-colored, with a silvery lustre, and the whole intricately shaded with dark Vandyke-brown, as in the figure. The light is most reflected from the edges of scales, which are beautifully shingled transversely. There are three principal dark-brown marks, namely, one broad and irregular, crossing the wing a little beyond the middle, and invariably containing a more or less complete pale ring on the posterior border just within the anterior median cell; and another, subobsolete, opposite, on its inner border: between this transverse band and the base is a smaller, irregular, brown mark, not extending to inner margin; and between the pale ring above described and apex of wing a third conspicuous brown mark, not extending more than one-third the width of wing. Each of these dark marks is relieved by a pale border and between them, the brown, blue and flesh-color are intricately mixed: apex rounded; posterior border dark, with a series of eight or nine more or less distinct rust-brown angular spots, just inside, the two largest being costal; fringes dark brown, with a deep blue gloss *Hind wings* light brown, becoming deeper around the posterior margin; fringes lighter. Whole under surface of a uniform leaden-brown—that of front wings somewhat darkest and showing costal marks No sexual difference except in the narrower and less pointed ♂ abdomen. Described from numerous bred specimens, those bred from Verbena buds showing no differences whatever from those bred from dry Tigridia seed. Our figure 126 represents an infested Trigidia seed (1), the larva natural size (2), the same magnified (3), the pupa shell (4), and the enlarged moth (5).—ED.]

* Proc. Bost Soc. Nat. Hist., IX, pp. 300-2

† Packard, Guide, etc, p. 321.

A CHRYSALIS FLYING.—Happening to be in my garden about the middle of June, I took to watching some butterflies flying among the cabbages. My attention was attracted to one by having, as it seemed to me, something strange on its back; I thought at first sight that it was being attacked by some ferocious insect; but on capturing it, which I succeeded in doing without difficulty, as its flight was a little heavy, I was not a little surprised to find that the poor Cabbage-butterfly (*Pieris rapæ*) was encased in its own chrysalis, its thorax and wings being out and its body within the chrysalis. I tried to extricate it from its peculiar position, but I found that its body was so completely fixed inside the chrysalis, that I could not get it out without injuring the butterfly. I killed it just as it was, and pinned it out; so it looks just like a chrysalis with wings.—A. M. F., *in Science Gossip*.

A METHODICAL TABLE OF THE CRICKETS.

Dear Sir: I send you a *Tableau Methodique* of the Crickets (*Gryllidæ*), which I have made up from Walker's Catalogue of this family—a work just issued, and which embraces not only the specimens in the British Museum, but all the species described up to the time of its issue. I have also added a list of the North American species of this family, not included in Mr. Scudder's Catalogue. C. THOMAS.

WASHINGTON, D C., March 14, 1870.

ORDER, ORTHOPTERA.

Sect. 2, SALTATORIA.

a.—Fore wings horizontal in repose. GRYLLIDÆ.
aa.—Fore wings deflexed in repose.
b.—Antennæ long, setaceous; tarsi 4-jointed. LOCUSTIDÆ.
bb.—Antennæ filiform, generally rather short. ACRIDIDÆ.

FAM. 1—GRYLLIDÆ.

Gryllides, Latr.; *Gryllina*, Macleay; *Achetidæ*, Leach; *Gryllodea*, Burm.; *Achetina*, Newm.

A.—Fore legs fossorial.
b. Hind tarsi of the usual form.
c. Tarsi 3-jointed.
d. Fore tibia hexadactylate. *Gryllotalpa*, Latr.
dd. Fore tibia didactylate. *Scapteriscus*, Scudd.
cc. Tarsi 2-jointed. *Cylindrodes*, Gray.
bb. Hind tarsi flat, digitate.
c. Four anterior tarsi 3-jointed. **Tridactylus*, Oliv.
cc. Four anterior tarsi 2-jointed. **Rhipipteryx*, Newm.
AA.—Fore legs not fossorial.
b. Head concealed. **Myrmecophila*, Latr.
bb. Head prominent.
c. Face rounded.
d. Hind tibiæ with spines.
e. Four anterior legs short, or but moderately long.
f. Third joint of the palpi not distinctly truncated.
g. Fore wings not very long.
h. Prothorax not very narrow.
i. Hind legs stout, of moderate length.
j. Hind tibiæ with stout approximate spines.
k. Tarsi 4-jointed. *Acheta*, Fabr.
kk. Tarsi 3-jointed.
l. First joint of the hind tarsi setulose. *Brachytrypes*, Serv.
ll. First joint of the hind tarsi smooth.
m. Head not ridged.
n. Head not conical in front.
o. Oviduct very narrow. **Gryllus*, Linn.
oo. Oviduct flattened. *Platyzyphus*, Haan.
nn. Head conical in front. **Mogoplistes*, Serv.
mm. Head ridged between the eyes.
n. Hind tarsi not serrated.
o. Fore wings regularly reticulated. **Tufalisca*, Walk.
oo. Fore wings irregularly reticulated.
p. Hind tibiæ not serrated. *Cassidava*, Walk.
pp. Hind tibiæ serrated. *Nessa*, Walk.
jj. Hind tibiæ with slender, wide-apart spurs.
k. Fore wings generally abbreviated.
l. Legs not very hairy.
m. Spines of the hind tibiæ not very long. **Nemobius*, Serv.
mm. Hind tibiæ with very long spines. *Argizala*, Walk.
ll. Legs very hairy. **Hapithus*, Uhler.
kk. Fore wings complete.
l. Fore wings membraneous.
m. Fore wings of the males not very broad.
n. Fore wings with transverse veins.
o. Prothorax not broader than the head.
p. Head not prominent between the eyes.
q. Fore wings with veins beyond the tympanum irregular. **Orocharis*, Uhler.
qq. Fore wings with veins beyond the tympanum regular. *Itara*, Walk.
pp. Head prominent between the eyes. *Madasumma*, Walk.
oo. Prothorax much broader than the head. *Lobeda*, Walk.
nn. Fore wings of the male very broad.
o. Legs not very slender. **Eneoptera*, Burm.
oo. Legs very slender. **Phyllopalpus*, Uhler.
mm. Fore wings of the male very broad.
n. Prothorax not narrower in front. *Eurepa*, Walk.
nn. Prothorax much narrower in front. *Lerneca*, Walk. *Salmania*, Walk.
ll. Fore wings coriaceous.
m. Fore wings not reticulated. *Scleropterus*, Hag.
mm. Fore wings reticulated. **Lebussa*, Walk.
ii. Hind legs very long.
j. Fore femora and fore tibiæ not spiny.
k. Eyes not very prominent.
l. Second joint of the hind tarsi very distinct. *Podoscirtus*, Scudd
ll. Second joint of the hind tarsi hardly apparent.
m. Wings complete. **Platydactylus*, Brulh.
mm. Wings none.
n. Spines of the hind tibiæ very short. *Laranda*, Walk.
nn. Spines of the hind tibiæ long. **Zaora*, Walk.
kk. Eyes very prominent.
l. Legs stout. *Orbega*, Walk.
ll. Legs slender. *Nisitra*, Walk.
j. (Not represented.)
hh. Prothorax very long and narrow.
i. Head elongated. **Œcanthus*, Serv.
ii. Head not elongated. **Laurepa*, Walk.
gg. Fore wings extremely long.
h. Body stout. *Tarragu*, Walk.
hh. Body very slender. *Nocera*, Walk.
ff. Third joint of the maxillary palpi directly truncated. *Triyonidium*, Ramb.
ee. Four anterior legs very long.
f. Hind femora not abruptly attenuated. *Luzara*, Walk.
ff. Hind femora abruptly attenuated beyond the middle. **Phalangopsis*, Serv.
dd. Hind tibiæ without lateral spines.
e. Prothorax produced hindward. **Cycloptilum*, Scud.
ee. Prothorax not produced hindward.
f. Body stout. *Ornebius*, Guer.
ff. Body very slender *Xabea*, Walk
cc. Face very flat. *Platyblemmus*, Serv.

*Those represented in North America. ACHETA is restricted to *Schizodactylus monstrosus* of Blanch., *Hist. Nat.*, iii. 31; Serv. *Hist. Orth.*, 322.

A LIST OF SPECIES OF GRYLLIDÆ NOT INCLUDED IN SCUDDER'S CATALOGUE OF ORTHOPTERA.

Gryllus septentrionalis,	Walk. pg. 18.		Mexico, St. Dom.
" *luridus*,	"	18.	Vera Cruz.
" *determinatus*,	"	19.	Jamaica.
" *similaris*,	"	20.	St. Domingo
" *angustulus*,	"	21.	Jamaica.
" *contingens*,	"	21.	Jamaica.
" *signatipes*,	"	22.	W. coast Am.
Mogoplistes occidentalis,	Scudd., *Pro. Bost. Soc. Nat. Hist.* Walk. p. 52.		Lower Cal.
Tufalisca lurida,	Walk. p. 53.		St. Domingo.
Nemobius mexicanus,	"	57.	Ojaco, Mex.
" *circumcinctus*,	Scudd., *Pro. Bost. Soc. Nat. Hist.* Walk. p. 57.		Mexico.
Hapithus quadratus,	Scudd., *Cent. Dec. Gryll.*		Texas.
Orocharis signatus,	Walk. p. 61.		Mexico.
" *scitulus*,	"	62.	Honduras.
" *fusiformis*,	"	63.	"
" *annulatus*,	Scudd., *Pro. Bost. Soc. Nat. Hist.*		Cent. Am.
Eneoptera insularis,	Walk. p. 66.		Jamaica.
Phyllopalpus latipennis,	"	68.	"
" *nigrovarius*,	"	70.	Mexico.
Lebussa tenuicornis,	"	75.	St. Domingo.
Platydactylus similis,	"	78.	"
Zaora cinctipes,	"	89.	Jamaica.
Œcanthus nigricornis,	"	93.	Illinois.
" *varicornis*,	"	94.	Mexico.
" *formosus*,	"	94.	"
Laurepa valida,	"	97.	Jamaica.

Cycloptilum squamosum, { Scudd., *Pro. Bost. Soc. Nat. Hist.* } Texas.

Scaptericus vicinus, { Scudd., *Rev. Foss. Crick.* 12, pl. 1, f. 4.23. } Cent. Am.

Ecanthus nigricornus, Walk., *Cat. Dermat. Salt.* p. 93.

"*Female.*—Testaceous, slender, shining. Head slightly elongated, with three black stripes extending from the hind border, one between the eyes and one on each side below the eyes. Eyes elongated, slightly prominent. Third joint of the palpi clavate, obliquely truncated, longer than the second. Antennæ black, testaceous at the base, very much longer than the body. Prothorax slightly longer than broad, fore border and hind border testaceous; two longitudinal testaceous streaks in the disk. Ventral segments black. Cerci and oviduct a little shorter than the abdomen, the latter black. Legs black, very slender; fore tibiæ slightly dilated and excavated on the inner side near the base; hind femora testaceous toward the base; hind tibiæ with six minute spines on the outer side, and five on the inner side. Fore wings cinerous, extending much beyond the abdomen, regularly reticulated; mediastinal vein with nine oblique branches. Hind wings extending much beyond the fore wings. Length of body 7½ lines. Illinois. Presented by E. Doubleday, Esq."

I give this in *extenso* for the benefit of our Western Entomologists, who may not as yet have received Walker's Catalogue.

A GOOD WORD FOR THE TOAD.

MR. RILEY: I was much interested in some extracts from "Fogt's Book on Noxious and Beneficial Animals," in your January number, and am induced to send you my own experience as another proof of the intelligence of toads.

Loving flowers, even when a child, with that love which makes a happiness of labor and patient waiting, my earliest possession was a small flower garden. I had been told that toads were very useful in a garden, and consequently transferred them, as they were occasionally found, to my own especial domain, which happened to be enclosed by a low brick wall and paling fence.

Although my toads seemed none of them afraid of me, I soon fancied that one of them followed me about my flower borders; and, watching carefully, I found my fancy to be a truth. My toad grew more and more attentive with time, and I frequently talked to him as he seemed watching my labors, and sometimes he would hop immediately where I was digging, then I quietly lifted him on one side with my trowel, saying: "Tom, you are in my way."

One day I threw some sweet crumbs that were in my pocket towards him, and was much amused to see him catch them before they fell to the ground. You will readily suppose that after this "Tom Toad" was very liberally fed. He grew fast, and his skin became very glossy, and the spots very brilliant; and I soon found that he not only knew my voice, but also my step. "My pet" became quite the jest of the neighborhood, and it was a common thing for my friends to sit upon the steps leading to the house, for me to call "Tom," and see him come hopping from some secluded place to catch his crumbs.

The windows of the basement opened on to my garden, and as the servant girls would be ironing by the windows, the toad often hopped in to watch their labors. They always bore the call quietly, unless he hopped upon the table or into the clothes basket, when the screams were loud for me to "come and take care of my bird." And thus, for about six years, Tom was made as comfortable and happy as a toad could be.

He always burrowed his winter quarters for hibernation in one place—directly by the kitchen window—and in early spring, as the weather grew warmer, the earth would gradually loosen and heave up over his back, and all at once he would hop forth. I did not particularly notice his condition, but for a day his movements were rather sluggish. I sometimes used to uncover him when he had come very near the surface, and tell him it was "time to get up;" and I dug away once to see how far he went down for his winter nap, and found the hole about a foot deep.

But at last, when I was about to leave home for a long term at school, it was insisted that "Tom" must be carried away, they were so senselessly afraid of him, and I carried him tenderly to a beautiful spot by our beautiful river, and said "good-bye." I never saw my toad again, and have never had such healthy rose bushes since.

Not long ago, I was telling of my toad to a friend, when he said that "one day he observed a toad in his garden always hopping in his way. He impaled a fly and held it to the Toad, who snapped it off from the stick in an instant. Daily, for quite a length of time, he amused himself with feeding the toad, until once, in mischief, he held to it a bee, and he thinks the bee stung the Toad, for it would never again notice him.

E. U. B.

BAR MILLS, Minn.

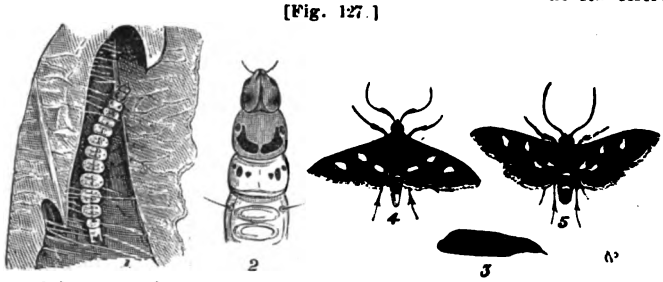
INSECTS BORING LIQUOR-CASKS.—There is a very small species of wood-boring beetle, known as the *Tomicus monographus*, which has for a number of years past been very destructive in India to casks containing malt liquors. More than one million of the small perforations made by this insect have been observed in one stave. Dealers in malt liquors suffer greatly from these pests, and are anxious to discover a preventive. This borer has lately been examined by British entomologists, who are endeavoring to ascertain whether this insect feeds on the oak staves for the liquor they contain, or because they are really fond of oak wood.—*Hearth and Home.*

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 8.

The Grape Leaf-folder.

(*Desmia maculalis*, West.)

[Fig. 127.]



Colors—(1 and 2) grass-green; (3) brown; (4 and 5) black and white.

The subject of this sketch has long been known to depredate on the leaves of the Grape-vine in many widely separated parts of North America. It is not uncommon in Canada West, and is found in the extreme southern parts of Georgia. It appears to be far more injurious, however, in the intermediate country, or between latitude 35° and 40°, than in any other sections, and in Southern Illinois and Central Missouri proves more or less injurious every year. It belongs to the same family (ASOPIDÆ) as our notorious Clover-worm, which attacks our clover stacks and mows. It was first described and named by Westwood*, who erected, for it, the genus *Desmia*.

This genus is characterized by the elbowed or knotted appearance of the ♂ antennæ, in contrast with the smooth, thread-like ♀ antennæ; the maxillary palpi are not visible, while the compressed and feathery labial palpi are recurved against the eyes, and reach almost to their summit; the body extends beyond the hind wings.

The moth of the Grape Leaf-folder is a very pretty little thing, expanding on an average almost an inch, with a length of body of about one-third of an inch. It is conspicuously marked, and the sexes differ sufficiently to have given rise to two names, the female having been named *Botys bicolor*. The color is black, with an opalescent reflection, and the under surface differs only from the upper in being less bright; all the wings are bordered with white. The front wings of both sexes are each furnished with two white spots;† but while in the male (Fig. 127, 4) there is but one large spot on the hind wings, in the female (Fig. 127, 5) this spot is invariably more or less constricted in the middle, especially above, and is often entirely divided into two distinct spots. The body of the male has but one distinct transverse band, and a longitudinal white dash at its extremity superiorly, while that of the female has two white bands. The antennæ, as already stated, are still more characteristic, those of the male being elbowed and thickened near the middle, while those of the female are simple and thread-like.

There are two broods in this latitude—and probably three farther south—during the year; the first moths appearing in June, the second in August, and the worms produced from these last hibernating in the chrysalis state. The eggs are scattered in small patches over the vines, and the worms are found of all sizes at the same time. These last change to chrysalids in 24 to 30 days from hatching, and give forth the moths in about a week afterwards.

The worm (Fig. 127, 1) folds rather than rolls the leaf, by fastening two portions together by its silken threads; and for this reason, in contradistinction to the many leaf-rollers, may be popularly known as the "Grape Leaf-folder." It is of a glass-green color,* and very active, wriggling, jumping and jerking either way at every touch. The head and thoracic segments are marked as at Figure 127, 2. If let alone these worms will soon defoliate a vine, and the best method of destroying them is by crushing suddenly within the leaf, with both hands. To prevent their appearance, however, requires far less trouble. The chrysalis is formed within the fold of the leaf, and by going over the vineyard in October, or any time before the leaves fall, and carefully plucking and destroying all those that are folded and crumpled, the supply for the following year will be cut off. This should be done collectively to be positively effectual, for the utmost vigilance will avail but little if one is surrounded with slovenly neighbors.

We believe this insect shows no preference for any particular kind of grape-vine, having found it on well nigh all the cultivated, as well as the

* Mag. Zool., par M. Guerin, 1831; pl. 2.

† Mr Glover, in the Agricultural Report for 1854, p. 79, says that the male has a semi-lunar mark of white on the outside of each spot, which in his figure, pl 6, ibid., is very distinct. In dozens of specimens bred in Illinois and Missouri no such mark appears, though there is an apparent coincident shade, barely distinguished from the black ground-color, on the outside of each spot in both male and female.

* We subjoin a description of this worm, as first given by us in the Prairie Farmer Annual for 1868. Average length, 0 80. Largest on abdominal joints, and tapering thence slightly each way. Color glass-green, always darker above than below. A narrow darker dorsal line, with each joint swollen into two transverse wrinkles. Laterally paler or yellowish, and a large and distinct piliferous spot on each joint, with others scarcely visible with a lens. Head fulvous, polished, horizontal, with two small eye-spots and two larger dark patches. Joint 1 of the same color, and marked as in Figure 127, 2. Joint 2 has two small spots, with an intermediate larger one, on each side. Legs yellowish. Acquires a carneous or pink tint before changing to chrysalis, which latter is of the normal color, size and form of Figure 127, 3, and has at the tail several very minute curved hooks, joining and forming into a point

wild varieties. Its natural enemies consist of spiders, wasps, and a small undescribed species of *Tachina* fly which we have ascertained to infest it in the larva state, and to which we have given the MS. name of *desmiæ*. There is every reason to believe that it is also attacked by a small clay-yellow beetle, the Grape-vine Colaspis (*Colaspis flavida*, Say), which, though a vegetable feeder, may often be found in the fold of the leaf in company with some shrunken, half-dead worm.

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

ROT IN PEACHES AND OTHER FRUITS.—*New Harmony, Ind., April* 20, '70.—I grow but few peaches and observe those closely, and I believe that I have generally, if not always, found that the rot proceeds from a bite, which I suspect is often made by a locust or grasshopper (*Locustadæ*), but I *know* that it is very often made by a brown soft-bodied insect that I call a cricket: it is, I think, a little bulkier than the insect figured in the ENTOMOLOGIST as the Snowy Tree Cricket. I have caught many of them while they were eating peaches and quinces. Shortly before the quince becomes tinged with yellow these creatures bite small pieces out of them; in certain conditions of the quince and of weather the wound heals, but the bites made when the weather is wet, or the quince is ripening, are fatal. Rot commences around the hole and rapidly spreads, and the small hole made by the bite is so obscure as not to be noticed by those who do not expect to find it. The same process goes on in the peach; it is attacked before it is nearly ripe, and in all its after stages; but the peaches do not fall until a mass of rotten matter almost obliterates the sign of the cause of the rot. Apples are injured in the same manner. Nearly all the rot that I have perceived in these varieties of fruit, I have found has commenced from the outside, and in that grown by ourselves I have found the sign of the bite, excepting where some, out of my reach, has been allowed to fall and smash. In the fruit I have bought I have often found the same sign, but very often I forget to examine; and, of course, most of the bitten fruit is left to rot in the orchard, or is consumed by pigs, and is not examined by any one. A fruit-grower here, in derision of my opinion, handed me two rotten apples and asked if they were bitten; I showed him that there was more than one bite mark on each of them, though these marks were somewhat obscured by the rot which ensued. I suppose this brown cricket (a chestnut-brown) when mature has the wings peculiar to its order; but I think when I have caught it, it has been wingless: it is easily crushed, and not easily caught without crushing.

[We shall be glad to receive specimens of the cricket in question. It may be the Jumping Cricket (*Orocharis saltator*, Uhler), which we know to have the pernicious habit of severing green grapes from their stems, and thus allowing them to fall upon the ground. We are well aware that the bite or puncture of any insect will induce rot in the fruits mentioned, when other conditions are favorable; and this fact only confirms our opinion, as expressed on page 137, that the puncture of the Plum Curculio has no special or peculiarly poisonous effect, and that it cannot be the sole cause of the Peach rot, as some persons contend it is.—ED.]

CLOVER-WORMS—*Eureka, Mo., April* 21, '70,—I am very thankful for your answer about the Clover-worm; but I have yet a little curiosity to know how the worm gets into, or why it chooses the center and bottom of the stack. Mr. Walsh's supposition (Pract. Ent., I, p. 83) cannot be correct, for my stack was on a new foundation, and at least two hundred yards away from any previous stacking place. G. PAULS.

[In the *Prairie Farmer* of April 20th, 1867, we have shown that Mr. Walsh was wrong in supposing that this worm can only increase prodigiously where clover has been stacked for successive years in the same place; and we have also demonstrated that the principal reason why they are so generally found at the bottom of a stack in winter, is, that they are attracted there for warmth and moisture.—ED.]

FLAT-HEADED APPLE-TREE BORER—*Eureka, Mo., April* 21, 1870.—Last fall, and early this spring, and even quite recently, I found on my apple trees small specimens of *Chrysobothris femorata*, about one-quarter inch long, or just of the size which the main crop has acquired in the month of August. I can only conclude that the eggs were either laid late in the fall, or that the annual soft-soaping in May so weakens the constitution of the larva that it cannot mature in the proper season. I have had but three borers escape my notice and get large enough to go into the wood, or body of the tree, and in every instance they penetrated in a straight or horizontal direction, for about one to one and a half inches, and then *downwards*. I fully indorse Mr. Wielandy's article on borers, in No. 5; especially what he says about the general fate of apple trees

planted in this part of Missouri. It was the fate of my first planting, and as long as people consider $2.00 too much for your paper, and entomology beneath their notice, they will have to learn the truth from woful experience. I can now, thanks to the teachings of the ENTOMOLOGIST, show trees as fine, smooth, and vigorous, probably, as those of Mr. Wielandy; though I cannot say that I am free from the borer.

[The young borers which escaped your vigilance last summer wintered in a dormant state, which accounts for your finding them of the same size either in early spring or late fall.—ED.]

FLOCK OF BUTTERFLIES—*Waxahachie, Ellis county, Texas, March* 31, 1870.—During my ramble this morning I happened upon a flock or bevy of butterflies, known as *Danais archippus*, Fabr., containing thirty individuals, four of which I captured for the purpose of identification, only two of which, however, I pinned down. I find them to be of the genuine *archippus*, identical in every respect, with specimens bred from the caterpillar by myself last summer, except in that of color, which is somewhat paler in these captured this morning than it was in those bred by me in the summer. They have the appearance of having been on the wing some days. The interesting question is, do they hibernate in the imago state, or in that of the chrysalis? They are wholly in advance of their larval food-plant, *Asclepias obtusifolia;* and from my observations upon the habits of the species, I infer that they hibernate as chrysalids. Please give us the facts as to the manner and condition in which they spend the winter, and oblige yours, respectfully,

L. J. STROOP.

[They undoubtedly hibernate in the perfect state, for we have often captured pale, faded and worn specimens quite early in the spring of the year.—ED.]

AN ANOMALOUS GRAPE SPHINX MOTH—*Covington, Ky., April* 19, 1870.—A friend yesterday gave me a badly battered specimen of a *Philampelus*, which is such a curiosity that I write to inquire about it. In size, and in the size and shape of the markings, it is identical with *P. satellitia*, as figured on page 90 of the present volume of the ENTOMOLOGIST, except that under the double discal dots of the anterior wings is a very short and narrow longitudinal dash. (Your figure has three small dots, but all of my specimens of *satellitia* have only two, although agreeing in all other particulars with your figure.) But the peculiarity about this specimen is, that a longitudinal line down the center divides the insect so that all of the spots and patches on the right side of the thorax and abdomen and front wing are light green, except the one on the thorax at the base of the wing and the large one on the hind margin of the wing near the base, which are of a rich dark green, not at all the color of *P. satellitia*, which I call rather dusky than green. The spots on the left side of the body and left wing are rust-red, varying to a light yellow drab; that on the thorax at the base of the wing, and that on the posterior margin near the base, being darker than the others. The line down the middle would divide the band across the metathorax and first abdominal segment into the same two colors. The spots on the two sides of the abdomen also differ, but not so glaringly. The hind wings are alike except that the drab appears again at the posterior angle of the left wing; otherwise the hind wings do not differ from those of *P. satellitia*. The ground color of the left anterior wing is also much lighter than that of the right wing. Both antennæ are missing.

It is clearly not *P. achemon* or *satellitia*, as figured by you; nor *P. Linnei*, nor *Lycaon*, as figured by Grote (*Pr. Phil. En. So.*, Vol. V., pl. 3). Indeed, the only one of these for which it could be mistaken, would be a hermaphrodite *satellitia*, in which there had been a wide departure from the normal colors even on the right side. But then I have never heard that there is any difference as to color between the ♂ and ♀ *satellitia*. A hole made by some insect in the side of the abdomen shows that it is a female, for the abdomen is full of eggs. It was picked up dead by some children last summer. What can you make of it?

V. T. CHAMBERS.

FOOD-PLANT OF GREEN SPRANGLING SLUG-WORM—*Elizabeth, Ind., March* 19, 1870.—The green, oval, flattened object, with lateral, tooth-like appendages, fringed with hairs, the two at the tail being longer than the others, and which you say is an undescribed species of *Limacodes*, or Slug-worm, sent you by me several weeks ago, were found feeding upon the leaves of a tree growing along the Ohio river and creek bottoms in this country, known as the Sycamore tree. I have ascertained this since the specimens were sent to you. Some of the specimens were much larger than the one sent.

LEVI G. SAFFER.

ERRATA.—Page 152, column 1, line 21, for "one" read "our." Page 163, column 2, line 6, for "results" read "result." Page 168, column 1, lines 15 from top and 6 from bottom, for "*Alanda*" read "*Alauda*."

THE PERIODICAL CICADA, *alias* THE 17-YEAR AND 13-YEAR LOCUST.

In the Missouri Entomological Report for 1868 will be found the following account of two broods of these singular insects, which are to appear the present season:

BROOD III.—*Septemdecim*—1853, 1870.

In the year 1870, and at intervals of seventeen years thereafter, they will in all probability appear in what is known as the "Kreitz Creek Valley," in York county, Pa., and possibly in Vinton county, Ohio, and Jo. Daviess county, Ills. Mr. S. S. Rathvon, of Lancaster, Pa., speaking of this brood, says: "Lancaster county is bounded on the southwest by the Susquehanna river, dividing it from the county of York, along the northeastern margin of which there is a mountain range sloping down to the river. Along that slope Cicadas were abundant the present season (1868—Brood XXII). But on the southwest side of the range, in what is known as the Kreitz Creek Valley, there were none. They appeared last in this valley in 1853, and previous to that year at intervals of seventeen years from time immemorial." Dr. Smith records their appearance in 1853, both in Vinton county, Ohio, and Jo. Daviess county, Illinois.

BROOD IV.—*Tredecim*—1857, 1870.

In the year 1870, being the same as the preceding, they will in all probability appear in Jackson, Gadsden and Washington counties, Florida, having appeared there according to Dr. Smith in 1844 and '57.

We earnestly ask our subscribers, who happen to live in the several parts of the country there mentioned, to report to us whether or not the insects appear according to prediction, as we wish either to verify and confirm, or disprove, the genuineness of these broods. We have every confidence that the 17-year brood (III.) will duly appear, as our correspondent, Mr. Rathvon, who has observed it in past years, is still living to make further observations; but as Dr. Smith, who recorded the appearance of the 13-year brood (IV.) is now dead, it would be very gratifying to have its periodic visits, at intervals of thirteen years, confirmed.

If any of our Georgia subscribers can give us the proper information, we should also very much like to know whether or not the Periodical Cicada appeared last year (1869) in Habersham, Muscogee, Jasper, Greene, Washington and adjacent counties in that State.

☞ Determined that our Journal shall stand solely on its merits, we take pleasure in being allowed to mention as contributors, among others, the following well known Entomological writers: Baron Osten Sacken, N. Y.; Dr. H. Hagen, Cambridge, Mass.; A. S. Packard, Jr., Salem, Mass.; F. G. Sanborn, Boston, Mass.; F. N. Norton, Farmington, Conn.; P. R. Uhler, Baltimore, Md., Dr. Jno. G. Morris, Baltimore, Md.; Dr. Wm. LeBaron, Geneva, Ills.; Rev. C. J. S. Bethune, M. A., Credit, C. W.; S. S. Rathvon, Lancaster, Pa.; Dr. H. Shimer, Mt. Carroll, Ills.; Dr. J. P. Trimble, Newark, N. J.; J. P. Stelle, Savannah, Tenn., and Mrs. Mary Treat, Vineland, N. J. We shall spare no means to make this magazine valuable alike to the practical and scientific reader, and we really hope that our friends, who appreciate our efforts, will speak a good word to their neighbors, as occasion may present. Sample copies sent free to any address.

THE DEATH-WEB OF YOUNG TROUT.

Soon after the article on page 174, with the above heading, was in type, we received from Mr. Seth Green specimens of the web-worm in question, and the mystery was soon solved. The worm is the larva of a two-winged fly belonging to the genus *Simulium*, the species of which are so well known to torment both man and beast by their irritating bites. In our next number we shall publish an interesting article on the transformations of this genus, from the pen of Baron Osten Sacken, accompanied by fitting illustrations.

ON OUR TABLE.

THE BUTTERFLIES OF NORTH AMERICA, with colored drawings and descriptions, by Wm. H. Edwards, American Entomological Society, Philadelphia. Part V. Price $2 50. We cannot say more in favor of this part than that it equals the preceding parts in every character. The species described and figured are *Argynnis Edwardsii*, *Colias eurydice*, *Limenitis lorquini*, *Grapta faunus*, *Lycæna pseudargiolus*, and *L. neglecta*. The synopsis of N. A. species is continued.

TRANSACTIONS OF THE AMERICAN ENTOMOLOGICAL SOCIETY. Vol. II, Part IV.

THE COUNTRY GENTLEMAN'S MAGAZINE for January, February, March and April. London.

PETITES NOUVELLES ENTOMOLOGIQUES.—Paris: M. E. Deyrolle, Fils. [We have only received two Nos.]

WOODWARD'S ARCHITECTURE.—Geo. E. Woodward, 191 Broadway, N. Y.

CONTRIBUTIONS TO THE NATURAL HISTORY OF NOVA SCOTIA; INSECTA, COLEOPTERA. Part I. By J. Mathew Jones, F.L.S.

ANSWERS TO CORRESPONDENTS.

NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

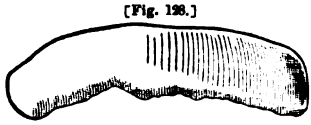
We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found. At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

How to Study and Breed Insects—*Jason E. Cowden, Amesbury, Mass.*—You are referred to the series of articles, from the pen of Mr. F. G. Sanborn, now appearing in our magazine.

Chas. E. Billin, Philadelphia, Pa.—Please refer to same article. See also page 68 at bottom of column 2.

Shed Snake Scale—*Jas. R. Hawkins, Vandalia, Ills.*—We have on two former occasions received just such an object as you send, and as your own words fitly describe it, we quote them: "Having a very rare specimen in my collection, I take the liberty of asking your opinion of it. It is about an inch and a quarter in length, by one-quarter in breadth, and is almost as thin as tissue paper. It is semi-transparent, and an ordinary microscope reveals no organs of life whatever. Still it is possessed of motion, and can travel over a table pretty briskly after the fashion of a measuring-worm. Its body seems hard to the touch, and has a fine polish which reflects the colors of the rainbow. When disturbed it quickly coils up like a watch-spring. I think a small piece of tissue from the inside of an onion, cut the proper length, would have a close resemblance to it. It was found on an old decayed log."

[Fig. 128.]



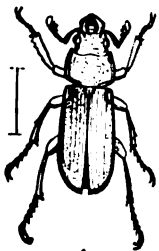
Color—Translucent white.

This wonderful creature is in reality a shed abdominal scale of some snake, and lest some other of our readers may at some future time be as sorely puzzled over it as you have been, we give an outline of it at Figure 128. Hairs and other epidermis are more or less hygrometric, and readily move under a change in the condition of the air. These snake scales are so sensitive that they will readily pulsate in keeping with the beatings of the heart, if the finger be held close to one end. We incline to believe, however, that its contracting has caused you to stretch the story of its moving briskly over a table *just a leetle*. If you place a hair on a hot stove, you will find that it will curl up as rapidly as the Hair-worms described in this number by Professor Leidy.

Worms under Mulch Hay—*J. F. Flagg, Meadville, Pa.*—The dirty brown worms, about one-half inch long, having a small shiny, brown, retractile head, four longitudinal rows of minute black spines, and terminating abruptly at the tail with a flesh-colored proleg below, and four pointed fleshy protuberances above, are the larvæ of some species of Crane-fly (*Tipula*). We have long since been acquainted with these worms, but they have never, so far as we know, been bred to the perfect state. We have observed them, in the month of February, crawling by thousands over the snow and ice in a meadow; and your finding them under the hay and leaves used as a mulch around your rose-bushes, is quite in accordance with their habits, for they love moist and cool situations. They feed on decomposing vegetable matter, but also sometimes seriously injure grass meadows by devouring the living roots. A little salt, sprinkled over the ground before the mulch is applied, would doubtless prevent their appearance, if that is what you desire. They are not cut-worms.

A new Pear-tree Insect—*E. J. Ayres, Villa Ridge, Ills.*—The blackish beetles with a greenish cast, and finely punctured, which have injured so many of your young pear trees, by completely eating out the ends of the new shoots, and of the buds just before they burst, belong to the family of "Horn-bugs" (LUCANIDÆ), as they are called in this country, or "Stag-beetles," as they are termed in England. The species is the *Platycerus quercus*, Sch., and may be known in popular language as the Oak Horn-bug. As its name would imply, it is perhaps common on the different kinds of oak, though we have met with it on but few occasions ourselves, and have never before heard of its destructive habit of devouring pear buds. In the larva state it feeds on dead oak logs and stumps. Attracted by the earlier development of the pear buds, compared with those of the different oaks, these beetles, with appetites sharpened by a long winter fasting, are led to invade your orchard during the early part of the season, but will in all probability retire to their usual haunts in the woods, as soon as there is a fit supply of their more natural food. But as your orchard is surrounded with timber and is more or less subject to such invasions every spring, we should advise you in future to protect the smaller trees just planted by covering them with millinet, as it is difficult to ward off beetles which fly so readily by any other means. As this is an entirely new enemy to the Pear we give an outline sketch of the female (Fig. 129), the male differing only in his somewhat larger size, and his rather more robust mandibles.

[Fig. 129.]



Color—Black, with a faint olive-green hue.

Apple-twig Borer—*Joel B. Myers, Iola, Kans.*—The brown beetle which you found boring into a small pear tree at the axil of a limb, is the ♀ *Bostrichus bicaudatus*, to which we have frequently referred in back numbers.

Cocoons of Polyphemus Moth—*H. J. Dunlap, Champaign, Ills.*—Your cocoons, found on a Morello Cherry tree, are those of the Polyphemus Moth (*Attacus polyphemus*, Linn.), which was figured in the March (1869) number of this magazine.

Galls on supposed Dock—*S. V. Summers, M.D., St. Louis, Mo.*—The galls on what you take to be some species of *Rumex*, are in reality the Golden-rod Moth Gall (*Gelechia gallæsolidaginis*,* Riley). You have doubtless been led into the error of confounding the two plants from finding these old Golden-rod stalks near some growing dock. We have long since known that *Chrysomela* [*Gastrophysa*] *cyanea*, Melsh., breeds on Dock, and from this habit, it might appropriately be called in popular language the Dock Leaf-beetle.

*Mo. Ent. Rep., I, p. 173.

Mossy Rose Gall—*W. M. Locke, Honeoye Falls, N. Y.*—The moss-like bunches (Fig. 130) of which you found eight on a single rose bush, and which attracted your attention from their resemblance to an old quid of tobacco, are polythalamous galls. They are composed of an agglomeration of hard cells, many of which are at present vacant, though some yet contain larvæ. The gall-fly which causes this gall is the *Rhodites rosæ*, Linn., an insect which Baron Osten Sacken found to be identical with a species which makes a similar gall on the rose in Europe, where it is known as the *Bedeguar* of the rose. The fly measures about 0.15 inch in length, and is principally distinguished by the ♀ having a black tip to her reddish abdomen. The larva of this gall-fly very closely resembles that of the Pithy Blackberry gall, represented in No. 5, at Figure 103, *c*. It is yellowish, has but 12 joints, of which the 4th is very short, and the 11th and 12th quite small; it has 7 pairs of spiracles, namely, a pair on each of joints 2, 5, 6, 7, 8, 9 and 10, and a large oval horny yellowish patch on each side of joint 1. The jaws are dark, and the head, in repose, is always bent under on to the breast. A parasitic larva often occurs in this gall, but may easily be distinguished from the true gall-maker by its whiter and more opaque color, its 13-jointed and slightly hairy body, the joints being less deeply separated, and by the absence of the horny piece on joint 1, and the more elongate and less bent forepart of body.

[Fig. 130]

Color—Green when fresh, yellow when dry.

[Fig. 131.]

Color—(stem) green; (punctures) gray.

Punctures on Rose Twig—*Geo. W. Copley, Alton, Ills.*—The punctures in the stem of the Multiflora Rose, and which we illustrate herewith (Fig. 131), are made by some insect unknown to us, for the purpose of depositing its eggs. There are ten of these rounded punctures, about one-half inch distant from one another, the fibres of the wood being torn in shreds longitudinally, looking very much like hemp, and contrasting strongly with the crimson and green bark of the twig. Upon cutting into these punctures the wood is found to be discolored and dead, as far as they extend, and in the centre of the pith, placed longitudinally, is an elongate dull yellow, opaque, soft, more or less flattened egg, 0.22 inch long and 0.04 wide, the anterior end tapering to a tolerably fine point, the posterior end more blunt. From the size and appearance of this egg we infer that it belongs to some Cricket (GRYLLIDÆ), and if we succeed in rearing it we will report results.

Snout-beetle—*M. T., Vineland, N. J.*—The Snout-beetles which you find so numerous, are *Hylobius confusus*, Kirb. We know nothing of its habits; but the beetles of this genus are timber borers, and usually in pine.

The Oyster-shell Bark-louse in Missouri—*B. P. Hanan, Luray, Clarke county, Mo.*—The section of a branch of a Sweet June apple tree, which you cut from the orchard of Dr. Wm. H. Martin, of Kahoka, in your county, is in reality covered with the scales of the common Oyster-shell Bark-louse (*Aspidiotus conchiformis*, Gmel). It is furthermore covered very thickly, and the white eggs underneath the scales are plump and healthy. This matter is of such vital interest and importance to the State of Missouri, and especially to those living in your county, that we quote part of your letter:

[Fig. 132.]

Color — Greenish brown, the eggs under the scales milk-white.

"This tree is rather badly infested, and I find by examination that they (the insects) are spreading slightly onto the nearest trees around it. Will they spread from one orchard to another, one or two miles distant? I saved my orchard from the native White Bark-louse, by sending you specimens of them and of their foes, and by learning from you what to do to destroy the lice I took your advice; encouraged the ladybirds, and they cleared my trees of the lice. If your advice in this case shall accomplish as much for my friend, Dr. Martin, the object of this communication will have been accomplished."

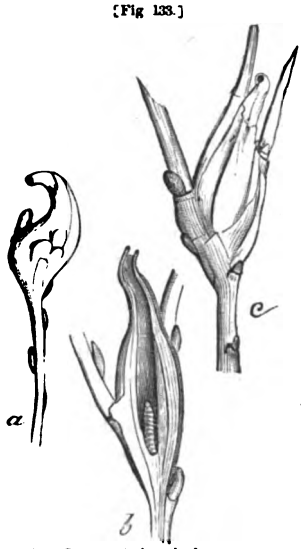
In our First State Report we published a full account of this insect, and demonstrated that though it was perfectly able to live and thrive in the northern half of the State, and had proved ruinously injurious in the adjoining sections of the States of Iowa, and more especially of Illinois; yet, in all probability, it was entirely unknown in our own State. In view of these facts, we laid great stress upon the importance of preventing its introduction, and of thus retaining the immunity which we had so far enjoyed. In the paper read before the State Horticultural Society at its last annual meeting, and published in No. 4 of the present volume of this magazine, we again called attention to the subject; and now for the first time we learn that this pest has actually been introduced, and our worst fears are but too surely realized! Just as might have been expected, too, the insect first gains a footing in the extreme north-east corner of the State—the point of greatest proximity to the infested sections of Illinois and Iowa. From the contents of your letter we infer that the lice are yet confined to the particular tree from which you cut the infested twig, and to a few of those surrounding it, and in the name of the State, we earnestly ask Dr. Martin to have this tree cut down to the ground, and every particle of it burned before the young lice hatch from the eggs now under the scales. The other trees should also be critically examined and properly treated. We cannot here repeat what we have already written on the subject, but refer you to the article above-mentioned, for the natural history of this insect, and the proper remedies to apply; and if Dr. Martin follows our advice, he can rest assured that it will not only accomplish as much for him as it did for yourself, but that it will also be of immense benefit to the State. It would be well to send to Chas. W. Murtfeldt, 612 N. Fifth street, St. Louis, for a dozen copies of the State Agricultural Report for 1868, which contains the article, so that it may be distributed among Dr. Martin's neighbors. We must, at all cost, stamp this insect out, before it spreads any further, and in order to definitely ascertain the limits

to which it has gone, we shall visit your county during the summer. If unmolested, this Bark-louse will not only spread from one orchard to another, one or two miles distant, but will in time spread through the whole county, and continue its destructive course like a devouring flame, from one county to another, until eventually the whole northern portion of the State is infested so that orchards may have to be abandoned, as they have often been in other States on this account.

Those trees which are not cut down, should be closely watched, and thoroughly syringed with strong tobacco-water, as soon as the young lice commence crawling about, which will be about the first of June. About two weeks after this syringing (just the time, by the way, to prune) cut off all the terminal twigs and burn them, by which means you will be apt to destroy any lice that escaped the syringing process, as they prefer to fix themselves around the ends and knots of such young terminal twigs. The ladybirds, which devour this as well as the native white species, should also be encouraged. For the benefit of those who are not yet acquainted with the appearance of the Oyster-shell Bark-louse, we produce an illustration (Fig. 132) of an infested piece of bark, at the head of this answer. .

The Pod-like Willow Gall—*J. R. M., Woodburn, Ills.*—The oval woody galls, averaging 0.75 inch in length and 0.40 inch in diameter, and terminating in a conical beak, which galls you find growing from the tips of the twigs of the Osier willow [*viminalis?*], and which we illustrate herewith, are the Pod-like Willow gall (*Salicis siliqua*, Walsh).

[Fig 133.]



Color—Same as twig; the larva orange.

This gall occurs on no less than six different Willows, namely, *Salicis humilis, S. discolor, S. rostrata, S. cordata, S. petiolaris, S. lucida*, and if yours were found on *S. viminalis*, that will make the seventh, and we therefore hope you will identify the species. Though slight differences, in size more especially, are noticeable between the galls growing on the different species of Willow, yet they are all produced by the same species of gall-gnat, which was originally described as *Cecidomyia salicis* by Dr. Fitch, in the American Quarterly Journal of Agriculture and Science, Vol. I, p. 263. The name *salicis* was, however, already preoccupied by an European species, and Mr. Walsh afterwards redescribed it under the name of *siliqua* (Proc. Ent. Soc. Phil., III, p. 591). The fly is one of our largest species, and the specimens from your galls issued about the middle of April. The pupa when about to change, works itself partly out of the terminal beak of the gall, and after the fly has escaped, the pupal integument, which is characterized by all the parts except the abdomen being dusky, frequently remains attached at the orifice. Our figure at *b* represents a section, showing the larva.

Bee Nest—*J. R. Muhleman, Woodburn, Ills.*—The delicate silken cells, each about 0.22 inch long, which are placed contiguously in a hollow currant stem, the bore of which has a diameter of 0.12 inch, are built by some species of small bee, and in all probability, as you suggest, by one belonging to the genus *Ceratina*. The larvæ which are now (March 25th) contained in these cells agree (as the cells themselves do) very well with Dr. Packard's description of those of the Double Ceratina (*C. dupla*, Say*). Should they prove to be this species, an important error in its natural history will be corrected; for, from the fact that the ♀ has been observed to deposit eggs in the middle of May, Dr. Packard concludes that there is but one brood each year, and that the perfect insect hibernates. If we are right in referring these cells to *Ceratina*, however, there are evidently two broods each year, the second brood hibernating in the larvæ state; and this seems the more likely, since even in New York and Massachusetts the perfect bees appear in July from eggs deposited in May. We present (Fig. 134) an illustration of these cells at *a*, and of the magnified larva at *b*; and if we succeed in breeding the bee will report further.

[Fig. 134.]

Color—(b) yellowish-white.

Beetles Named—*S. V. Summers, St. Louis, Mo.*—Your insects are as follows: No. 1, *Gyrinus analis*, Say. No. 2, *Aphodius bicolor*, Say. No. 3, *Hydrophilus lateralis*, Herbst. No. 4, *Dineutes assimilis*, Kirb. No. 5, *Opatrinus notus*, Say. No. 6, *Copris ammon*, Fabr. No. 7, *Copris carolina*, Linn. No. 8, *Geotrupes excrementi*, Say. No. 9, *Copris anaglypticus*, Say. No. 10, (A) *Canthon chalcites*, Hald. No. 10, (B) *Canthon lævis*, Drury. These two are very similar, but *chalcites* always has a smooth and *lævis* a rough-punctured anus. No. 11, *Parandra brunnea*, Fabr. No. 12, *Pelidnota punctata*, Linn. No. 13, *Tenebrio tenebrioides*, Lec. No. 14, an English species, we cannot undertake to name; it is a *Mycetophagus*, and probably *quadripustulatus*. No. 15, *Philonthus apicalis*, Say. No. 16, *Pirates picipes*, Ill. Sch. No. 17, *Casnonia pennsylvanica*, Linn. No. 18, *Julus marginatus* (myriapoda). No. 19, *Dermestes nubilus*, Say. No. 20, *Chlænius pennsylvanicus*, Say. No. 21, *Platinus punctiformis*, Lec. No. 22, *Ischyrus, 4-punctatus*, Oliv. No. 23, *Bembidium posticatum*, Hald. No. 24, *Aphodius fimetarius*, Fabr. No. 25, *Bembidium lacrigatum*, Say. No. 26, same as 25. No. 27, *Oodes cupreus*, Chaud. No. 28, *Pterostichus chalcites*, Say. No. 29, *Haltica* ————? No. 30 we are not acquainted with; it must be foreign. No. 31, *Bembidium caudatum*, Lec. For the proper determination of several of them, we are indebted to Dr. Horn, of Philadelphia.

*Guide, etc., p. 134.

Botanical Department.

Dr. GEORGE VASEY, Editor, Richview, Ills.

THE HERBARIUM.

The objects in Nature are so numerous and diversified that it is impossible for any one to retain in the mind a distinct and clear conception of all the species in any one of the departments of Nature. Every Naturalist also knows how difficult it is to describe, by pen or type, clearly and accurately the characters of a species, so that it may be easily identified. Hence the importance, in the different departments of Natural science, of collections or museums of natural objects. For instance, it is impossible to give a learner a clear idea of the nature of granite, limestone, sandstone, or other rocks and minerals without an examination of specimens. Indeed, it may be safely stated that no man can become a good Naturalist without the preservation, in some form, of the objects of his research.

In pursuing the study of Botany, it is of the greatest importance that specimens of the plants examined should be preserved for comparison with other species. We hope many of our readers will commence with the opening of spring to make collections of dried plants, and to aid them in this work, we present a few directions, by following which, we think, they will succeed in obtaining satisfactory specimens.

A very good and convenient press consists merely of two pieces of planed board, each about fourteen by twenty inches, and with two cleats screwed across each board to prevent it from warping or splitting.

Next provide an abundance of paper for dryers; common wrapping paper will do, about twelve by eighteen inches in size; or newspapers folded to about that size will answer. Then we want a quantity of plain white printing paper, of about the same size. Newspapers folded to the proper size will do for many plants, but the white printing paper is best.

Now, how much of a plant shall we take for a specimen? Whenever the plant is small enough to go into a sheet ten by sixteen inches, without much crowding of the parts, take the whole plant while in flower, or what is better, in flower and fruit, when possible, and with the root also, or a part of the root, if large. The principle is to have as fair and full a representation as possible of all the parts of the plant.

The roots, or the bulbs and tubers, of some plants are important characters, and sometimes furnish distinctive marks of great value. When the bulb or tuber is large and bulky, it will be best to slice off longitudinal pieces to reduce it to proper size. Some long and slender plants, as grasses, can be easily bent once or twice, so as to include the whole plant in a single sheet. But where the plant is too large to be used entire, we take a portion—as a branch, with leaves, flowers and fruit if possible.

In some cases we have to take specimens of a plant at different times, in order fully to represent its characters. For instance, some Willows, the Elms and some Maples, develop their flowers, and nearly mature their fruit, before the leaves are fully expanded. In this case we get specimens, first of the flowers and afterwards of the leaves and fruit.

Now, suppose we are ready to prepare a botanical specimen. We first lay down one of the press boards, upon which we place five or six sheets of the drying paper. Next the specimen is to be spread out, as naturally as possible, on the white sheet. Of small plants several specimens may often be placed on one sheet. This sheet, containing the specimen or specimens, is next to be placed on the layer of dryers, and five or six sheets more of dryers to be placed above it. Now, if we have any more specimens, we may fill another white sheet and place on more dryers, and so alternate them until we have in press all the specimens we wish. Then we place the other press-board on the top of all, and upon it we place a heavy weight, not generally less than fifty pounds, and for most plants, especially when there are many in the press, a hundred pounds will not be too much.

The usual custom is to leave the press in this state for about twenty-four hours, then remove the dryers, which have by this time become damp with the moisture absorbed from the plants, and replace them with fresh ones; then reapply the weights and leave them for another day, repeating the change of dryers daily until the moisture is entirely removed from the specimens, which will usually require about one week. Some succulent plants will require a longer time. The damp papers may be dried and prepared for use again by half an hour's exposure to a hot sun, or if necessary they are to be dried by the stove.

It frequently happens that, after a lot of plants have been in press for one, two, or more days, we want to introduce more specimens. In this case we should separate the fresh ones from the others by intervening a piece of oiled cloth, or oiled paper. When dry the specimens are to be carefully put away in the Herbarium.

We shall be surer of making good specimens,

and shall make them in less than half the time, if we change dryers twice a day. With some delicate plants this is essential, in order to preserve the colors of the flowers.

It will be remarked that this process involves a considerable amount of labor. True, it does; but it will pay. No person can become an accurate practical Botanist without an Herbarium; for well prepared specimens may be kept any length of time, and are always ready for examination and comparison. Besides, a good Herbarium is a source of pleasure. What is more suitable for a place on the parlor table than a good Herbarium, even though it contain only a score or two of plants? How much enjoyment and pleasure may be derived from such a collection? The Ferns and Mosses especially make beautiful specimens, well worthy a place in every lady's cabinet of curiosities.

THE COMMON VIRGIN'S BOWER.

(*Clematis Virginiana*, L.)

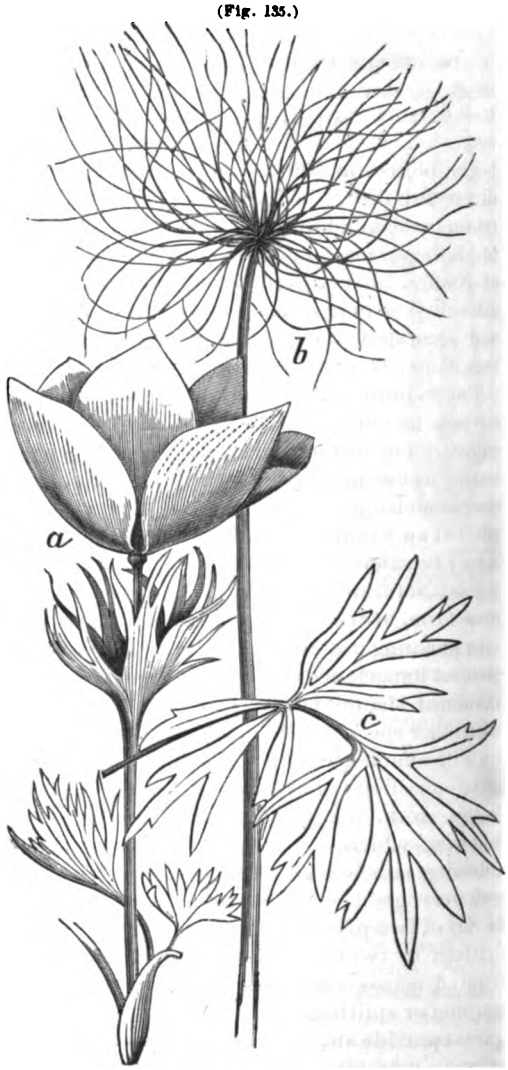
This is a perennial climbing vine, which might be introduced into our gardens with good effect. Its flowers are not as showy as those of some foreign species, but its greatest novelty consists in its copious clusters of feathery tailed fruit, which hang on the vine late in the season and are conspicuous objects of attention even when seen in a wild state. The Atragene (*Clematis verticellaris*, D. C.) is a smaller species, with rather large and showy single flowers, succeeded by single heads of tailed fruit. It is a rare species, occasionally found in rocky woods, and would be a pleasing addition to our cultivated list.

In every part of our country there are native plants that are as worthy of cultivation as the foreign ones which are commonly found in gardens. Every large district of country has some species which are peculiar to itself, and this fact furnishes an opportunity for exchange between the cultivators of different sections. Only a small number of our native plants have been introduced into our gardens. We have an immense variety to select from, and a little care in their management would improve their size and beauty, and probably in some cases produce that condition which is generally sought for by florists, namely, the tendency to produce double flowers.

ERRATA.—Page 183, column 2, line 21 from bottom, for "Fig. 113" read "Fig. 115." Page 188, column 1, line 16, for "*Cersis*" read "*Cercis*."

PULSATILLA.

(Fig. 135.)



American Pulsatilla or Easter Flower. (*Anemone patens*, L., var. *Nuttalliana*, Gr.)

The genus *Anemone* is pretty well known, in some of its species, all over our country. The name is derived from a Greek word signifying wind—given, as some think, because many of them bloom in the windy days of spring. The genus has representatives in all the principal divisions of the globe. In the Northern States we have eight species, including *Pulsatilla*, which until recently has been considered a distinct genus. It differs chiefly from other species of *Anemone* in having long feathery, or tailed seeds, as in Clematis, while in *Anemone* proper the seeds are short, and without the tailed appendages.

We present a figure of our American *Pulsatilla* (Fig. 135), which is a variety differing little from

the European *Anemone patens*, and is distinguished as the variety *Nuttalliana*, Gr. It grows somewhat sparingly on gravelly hills, or banks, in northern Illinois, in Wisconsin and Minnesota more abundantly, and thence westwardly to the Rocky Mountains. The flower (Fig. 135, *a*) usually makes its appearance early in April. It is of pretty large size, and of a bluish-purple color, varying to a light blue. The flower has not the usual two sets of floral leaves, *i. e.*, calyx and corolla, but only the external set of sepals, which, however, are petal-like in texture and color. There are usually six of these sepals, from one to one and a half inches long, oblong, and covered externally with scattered silky hairs.

The flower blooms before the development of the leaves, and at first seems to be closely surrounded by the involucre of finely dissected leaves which is just below it; but it gradually pushes itself up on a stem, which finally becomes two or three times as long as the portion of the stem below the involucre (Fig. 135, *b*). Finally the sepals and stamens drop off, and a head of fifty to eighty seeds, with fine silky tails an inch and a half long, is matured. During this time, also, the radical leaves (Fig. 135, *c*) are developed. The whole plant is at first covered with silky hairs, which mostly wear off with age.

In the north of Europe this plant and a nearly allied species, *Anemone Pulsatilla*, are well known as the Pasque flower, or Easter flower, and they are often used to decorate the churches during Easter. The Pulsatilla has also attained great celebrity as a medicinal plant, especially in homœopathic practice.

In tropical countries many species of plants live entirely upon what they obtain from the air. They usually grow upon trees, but not in the manner of parasites, because they do not insinuate their roots into the tissues of the tree, or plant, and draw from it its juices. These are called Epiphytes, or air-plants. It is stated that in the island of Java there are over three hundred species of *Orchidaceous* plants of this character. The Spanish Moss of our Southern States, which is seen hanging in long, tangled threads from the branches of trees, belongs to this class of air-plants. Many lichens growing on bare rocks are true *epiphytes*, as is also a species of lichen (*Parmelia mollinscula*, Ach.) which grows on the arid plains of the Rocky Mountain region. Parasitic plants differ from air-plants in not only growing upon other plants, but in drawing their sustenance from them. The Mistletoe strikes its roots into the branch on which it grows so thoroughly as to be inseparable from it.

VEGETABLE CELLS.

BY DR. FELIX SCHAAN, CHICAGO.

PART I.

In our microscopical investigations we meet with two kinds of objects—those originating in the mineral kingdom, as crystals, their polarization, decomposition, etc.; and those having connection with organic life. The latter are classed in two grand subdivisions, viz., the Vegetable and Animal Kingdoms. In both we find one common ground form of being, the cell. This is the foundation-stone of the entire Vegetable and Animal Kingdoms, and is a subject of overwhelming importance. We propose at this time to discuss the vegetable cells, in their different phases of generation, life and death.

The vegetable cell is composed of an outer coat of cellulose, including closely another of nitrogenous matter, called the primordial vesicle. This contains certain substances, as starch, fat, crystals, chlorophyl, granular matters, gas, and a nucleus called cytoblast, which contains one or more nucleoli. Let us pass in review all these parts, in order to have an acquaintance with the whole cell.

1. *The Cellulose.*—The cellulose pure is white, transparent, diaphanic, insoluble in water, in spirit of wine, ether, or the fixed or etheric oils. Feeble solutions of acid exert but little action upon it, even by boiling; it is the same with feeble alkaline solutions. The resistance which the cellulose opposes to these reactives varies, however, with its cohesion; the newly built cellulose alters easier than that of older formation.

Concentrated sulphuric acid ($S O^3$) transforms the cellulose into a substance called "dextrine." Nitric acid ($N O^5$) transforms it into an exceeding combustible and explosive substance known under the name of "cotton-powder." Boiling nitric acid transforms cellulose into oxalic acid. Acetic acid does not attack the cellulose. The cellulose does not change its color by the addition of an aqueous solution of iodine; but when the sulphuric acid has commenced its disaggregation, the iodine gives it a beautiful blue hue.

This chemical reaction is one of those we use to prove the existence of cellulose under the microscope. The chemical composition of cellulose is represented by carbon ^{12}, hydrogen ^{10}, and oxygen ^{10}.

Some may wonder how we are able to give these facts on studying a membrane not thicker than one ten-thousandth part of an inch. We state these facts by way of isolation—by taking divers parts of vegetables and submitting them

successively to different chemical reactions which effect a destruction of all foreign matters adherent to the membrane in question.

There is no difficulty in showing you this part of the vegetable cell. Take a potato, cut it, and take from the cut surface a very thin slice on an object-glass; cover it with a covering glass plate, and add a drop of water. You will remark on the edges of the slice many cells, in some parts only a portion, rent, lacerated, and out of connection with the adjacent cells.

If you have any doubt of that being a cellulose membrane, you add some solution of Iodine. Instantly you see the starch in the cell colored a deep blue. The membrane remains transparent, white as before. Add a drop of sulphuric acid and you will see, after a while, the membrane also take a blue hue, but not so intense by far as the starch bodies near by. The parts near the corner where you let enter the sulphuric acid are colored first, and the color advances gradually in the other direction.

I made some fine slices of the root of *Valeriana officinalis*. In putting them between the glass plates I could not distinguish any cellulose membrane, or any indication of it. It was because the salts spread through the cells, and the incrustations in their walls rendered the membrane opaque. In boiling the preparation, the water took so much of the soluble salts away that the cellulose membranes could be seen very clearly. This boiling can be performed in any vessel; but for our purpose it suffices to add some drops of water to the object glass, and hold it for an instant over the alcohol lamp. The jumping up and down of the covering glass-plate denotes that there is steam formed, whose expansive power is utilized in the locomotive.

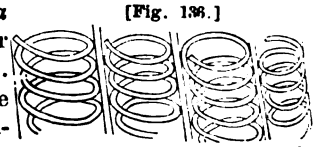
Now the cellulose membrane is degarnished enough to be observed, and we can try the same experiment with the iodine and sulphuric acid as alluded to before. It is indifferent which of the two you add first. I boiled the valerian root in water containing a few drops of sulphuric acid, and the membrane grew free to a greater extent, because the sulphuric acid is a strong dissolvent for organic as well as for inorganic salts. When you put this slice under the microscope, and add a drop or two of iodine solution, you remark easily the growing of the blue color at the margins before white. I tried the same experiment on a fungus which luxuriated upon an animal matter, but with a negative result. A fungus growing in a sugary solution should be carefully washed, because the sugar, being transformed by sulphuric acid into dextrine, can take the blue color by adding iodine. The cellular membrane of these two vegetables (potato and valerian) is smooth, without any pores.

The successive coloring of the contents of an integer cell from the side from which the reactive comes, demonstrates that it is only by the law of Osmose, and not through pores or other holes in the wall that the coloring is effected.

We find often at the inside of the cuticle of cellulose, layers of different form, thickness and arrangement. These layers have sometimes the form of a circle, sometimes of a spiral, sometimes of large deposits covering more or less the entire surface of the cell.

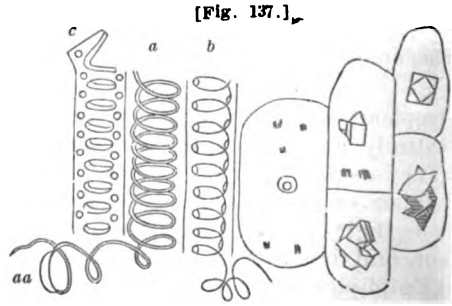
When the cell contains one or more rings, it is called the *cellula annulifera*, or ring-bearing cell. We find these mixed with spirals in a transverse cut of a leaf of Hyacinth (Fig. 136). When the two ends do not grow together, then the layer inside the cell takes the form of a spiral; this spiral can run from the left to the right, or from the right to the left. The cells containing the spiral are called fibre cells, when the fibres are clearly separable from the cell wall. A transverse cut of Hyacinth shows very distinctly these spirals. And you can also distinguish some fibres running from right to left, and one running in the contrary direction. The same can be observed in a few cells out of the pith of Geranium.

[Fig. 136.]



Transverse cut of Hyacinth leaf

[Fig. 137.]



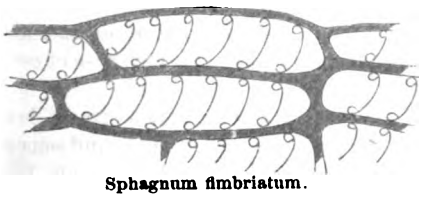
Pith of Geranium

In this example I had rent the spiral out of the cell, and so I could study it more closely. I found it an elastic substance without hole in the interior, the breadth being everywhere the same. In one part I distinguished that the fibre-ribbon was split in the middle (Fig. 137, *aa*) but soon coming together again, leaving a kind of buttonhole.

In the fibrous cell adjacent (Fig. 137, *b*) I remarked that, at the borders of the cell where the fibre-ribbon passed from above to below, there was a little white space (Fig. 137, *c*), the effect of the interference of the light. I followed the

spiral, and found at one end, where it was rent out of the cell, that it was also an entire fibre, and I could see that the white spots at the twining was not occasioned by a pore or a hole in the wall of the cell. This observation was very interesting, because it gave me the opportunity of explaining such white spots at the ends of a tender line in the cells of a moss (*Sphagnum fimbriatum*), which I was unable to do before (Fig. 138).

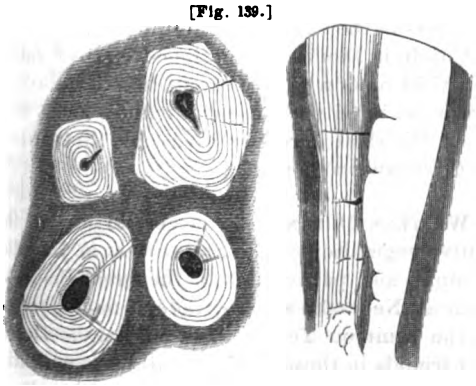
[Fig. 138]



Sphagnum fimbriatum.

This tender line is nothing else than a spiral. This fibre could not be isolated from the cellulose, but it adhered very fast to it, and broke just at the same place as the cellulose, as you can remark in the lacerated cells of the edge of a slice. That might be considered as the transition to the porous cells (*cellulosæ porosæ*), in which the fibres are so grown together as to appear like a continuous membrane beset with little pores. Close by the fibrous cells you can find them in the pith of Geranium (Fig. 137, *c*). It presented itself in the shape of a ladder, the pores are horizontally disposed at equal distances from each other; in the middle of each pore you can see a transverse line dividing it into two halves—an effect of interference of light. In the thickness of the wall of the cell at both sides, and corresponding to the space between the pores, we remark a swelling of the cellulose; this is the result of the growing together of the fibre and wall.

[Fig. 139.]



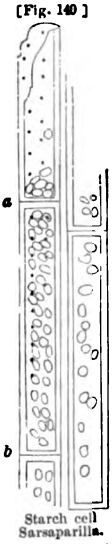
Transverse. Longitudinal.

Liber cells of Cinchona calisaya.

When the inside layers are deposited merely on the entire surface of the cellulose wall, then we have a successive growing of the wall in a regular way, depositing ring upon ring, spiral upon spiral, porous layer upon porous layer; or the layers are deposited irregularly—the first is mostly the case.

A transverse and a longitudinal slice of liber-cells of the Peruvian bark (*Cinchona calisaya*) gives us a splendid illustration of this. You can pursue the pores through the entire layer, which has the aspect of a series of boxes inclosing one another. (Fig. 139.)

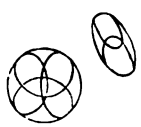
[Fig. 140]



Starch cell Sarsaparilla.

In the starch-cells of the root of Sarsaparilla (*Smilax sarsaparilla*) the pores are deposited with regularity. I remarked that, by cutting the slice, the pores near the edge did not rend; and by adding iodine, the starch inside the integer cell (Fig. 140, *b*), attached with its top to the lower end of this lacerated cell, took its blue color merely in accordance with the law of Osmose. The starch granules near the top (Fig. 140, *a*), where they are separated from the contact of the iodine by *two* membranes, colored first and more intensely, because the capillarity sent a large amount of iodine in that direction.

[Fig. 141.]



Compound starch cell Sarsaparilla.

HOW TO STUDY THE GRASSES.

The study of the grasses is attended with some difficulty on account of the smallness of the parts composing the flowers, and is undertaken by very few, even of those who study with some care the more conspicuous flowering plants. But for those who will have the patience to attempt their investigation, Nature spreads out an open and inviting field, and the explorer will be rewarded by discoveries of as great interest as in any other department.

Let us notice some of the principal parts, or organs, entering into the flower structure of the grasses. The flowers of grasses are sometimes in spikes, as those of Timothy or Herd's-grass, and sometimes in loose, open panicles, as those of Red-top. Each spikelet, or smallest subdivision of the spike or panicle, whether consisting of a single flower or of a number of flowers, has commonly a pair of outer husks called glumes.

Each individual flower is composed of two inner husks or scales called paleæ, three stamens (each consisting of a thread-like stem or filament), a pollen-box or anther, and a pistil, composed of the germ and two hairy or feathery

styles. The outer pair of glumes is sometimes wanting, and in some cases one of the inner pair is either absent or imperfect.

It is well to begin the study of grasses by examining first the structure of some of those having large flowers, as the common Oat (*Avena sativa*, L.) Here if we take one of the smallest spikelets, we find first a pair of large husks or glumes, one of them at the bottom rather folds over the other, and is affixed to the stem or rachis a little below it, hence it is called the lower glume; the other is called the upper glume. Just within these glumes will be seen two or three flowers, in each of which we may observe the two palets, and, if the specimen is collected in flower, we will find the stamens and styles, but if the ripe oat is examined we shall find within the palets only a grain; or, indeed, one of the two or three flowers may be sterile or imperfect.

A wild grass (*Stipa spartea*, Trin.) growing on the native prairies and plains of the West, and sometimes called Wild Oats, or Porcupine grass, on account of the slender, twisted awn or bristle, four to six inches long, which encloses the seed, has very conspicuous glumes, one and a half or two inches long; but very few of our grasses have flowers of such magnitude, while in some species the flowers are less than one line in length.

After acquiring familiarity with the floral organs in some of the larger specimens, the learner will have little trouble, with the aid of a common lens, and of the excellent figures in Gray's Manual, in getting an acquaintance with any of the common grasses. We trust our readers will improve the coming season in an investigation of this subject.

POISONOUS PLANTS.

"At Walcott, in this county, on Monday evening, Harry, aged 5½ years, son of Dr. T. Byrnes, and Willie, aged 7 years, son of Mr. Barche, died from eating the poisonous root known as wild parsnip or Hemlock. The children were playmates, and about six o'clock took a walk along the railroad track, where they discovered the plant, of which they ate. The first intimation any one had of anything being wrong was about seven o'clock, when little Harry came home and told his mother that his playmate, Willie Barche, was down there (pointing to the railroad) sick. He said, 'Willie staggers like a drunken man, and he is sick, Mam, he is real sick; and I feel sick, too.' Dr. Byrnes, who was at home, overheard the remark, and, on looking, saw Willie lying down upon the ground. He immediately requested Mr. Peck, station agent, to bring the child to the house. This was done, but the poor little fellow was then in a state of collapse, and soon went into violent convulsions, and died in half an hour. Mrs. Byrnes, when apprised by her little son that he was sick, consulted her husband, and a strong emetic was given the child. Being asked what he had eaten, he said, 'Only two little roots about as big as my finger.' The child continued to grow worse, and in a short time was seized with convulsions, and, despite all remedies, died at midnight."—*Davenport Gazette*, April 20.

It is now an appropriate time to give a word of warning respecting poisonous plants. Every spring we find such accounts as the above in the public prints, of cases of poisoning from the use of roots which are mistaken for those of esculent vegetables.

A few years ago, we knew a strong, healthy young Norwegian, who, having found some roots just beginning to develop leaves, ate two or three of them, under the belief that they were parsnips. In an hour or two he was seized with pain and vomiting, and before medical aid was procured he was dead. The roots were those of the Spotted Cowbane (*Cicuta maculata*, L.), a plant which occurs all over the country in low moist grounds, and has been the occasion of many cases of poisoning.

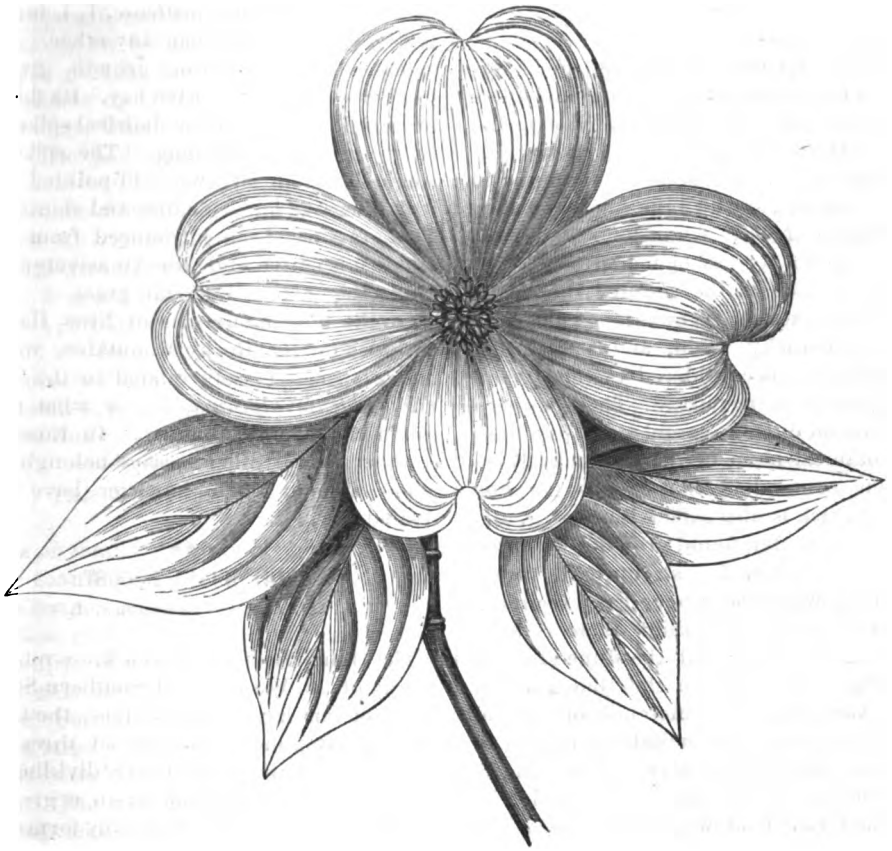
Two years ago, several children near Centralia, Ill., were poisoned from eating the roots of another plant, which grows in the southern part of the States of Ohio, Indiana and Illinois, in similar situations with the preceding, and is botanically called *Eulophus Americanus*, Nutt. It has no definite common name so far as we know.

These two plants belong to the Natural Order *Umbelliferæ*, or to the same family as the Caraway, Parsley, Carrot, Parsnip, &c. It embraces many poisonous plants, among them the Poison Hemlock (*Conium maculatum*, L.), the juice of which, it is supposed, was employed by the ancients in the execution of criminals.

Children should be cautioned against eating any wild roots without the sanction of those who are acquainted with them and know what they are. We shall hereafter give some illustrations of these poisonous plants.

WESTERN BOTANY.—A large portion of the native vegetation of the States west of the Mississippi, and particularly of the great Plains of Kansas, Nebraska and Colorado, is not described in the common Text-books of Botany. Hence our friends in those sections will meet with difficulty in becoming acquainted with the plants they meet with there. The names and descriptions of such plants are contained in Pacific Railroad Reports, and in published proceedings of various scientific societies.

[Fig. 142.]



The Flowering Dogwood.

THE FLOWERING DOGWOOD.

(*Cornus florida, L.*)

There are many kinds of Dogwood (*Cornus*), the most of which are shrubs varying in height from five to ten or fifteen feet, and distributed over nearly all parts of our country. But the most attractive and showy of all the Dogwoods is that species botanically called *Cornus florida*, L. It is a small tree, growing from fifteen to twenty-five or thirty feet high, having a pretty wide range of latitude, from 47° N. to Florida, being rare, however, in the northern latitudes. Its natural situation is in rocky woods, and on the borders of streams.

It is a very conspicuous object when in flower, from the profusion of large white blossoms, or rather what appear to be blossoms, for the apparent blossoms are not really such. The true flowers are very small, and clustered together in a small head. Each of these minute flowers has all the parts proper to a perfect flower, calyx, corolla, stamens and pistil. Immediately beneath the cluster is developed four large white leaves, looking like petals, but really forming what is called an involucre. These involucral leaves are inversely heart-shaped, and about an inch and a half long. At a distance they look like the proper petals of a single flower, while the small head of true flowers which they surround looks like the central organs of a flower. A close examination will readily detect the true nature of these parts.

The wood of the Dogwood is very close-grained, hard, capable of an excellent polish, and useful for the manufacture of many articles requiring durability and firmness of texture. The bark of the tree is bitter, and has long been known and employed as a substitute for, or adjuvant of, Peruvian bark and quinine in the treatment of ague and malarious diseases.

The tree is well deserving of cultivation from the showy appearance of the snow-white flowers, or floral appendages (Fig. 142), which contrast finely with the lively green of the foliage, and from the bright red berries which succeed the flowers.

OUR CULTIVATED GRASSES.

The grasses which in this country are cultivated for pasturage and hay-making, are chiefly Blue-grass (*Poa pratensis*, L.), also called June-grass, Red-top (*Agrostis vulgaris*, With.), and Timothy, or Herd's-grass (*Phleum pratense*, L.) Several other species are occasionally found in lawns and orchards, and an annual species called Millet (*Setaria italica*, Kunth), is somewhat extensively grown for hay or fodder.

In some portions of the country Blue-grass has acquired an extended reputation as a pasture grass. In Kentucky, Ohio, and some other Western States, it is considered the most valuable of all grasses for pasturage. There has been much discussion during several years past as to the real botanical name of the Kentucky Blue-grass, some contending that it was the *Poa compressa*, which is also called Blue-grass, and which, in fact, is often found growing with *Poa pratensis*. The latter has an upright, round stem, or culm, while the former has a reclining and flattened stem, We think there is little doubt among botanists that the June-grass of the Northern States is also the Blue-grass of Kentucky, varied only by differences of soil and climate. The genus *Poa* includes a number of other species, which have more or less value as forage plants, the most important of which is, probably the Fowl Meadow-grass (*Poa serotina*, Ehrh.) This is found as a native grass in many parts of the country, forming, indeed, a considerable proportion of the grass of sloughs and wet meadows in Northern Illinois and Wisconsin. Though somewhat coarse, it is a very productive and useful grass.

Red-top (*Agrostis vulgaris*, With.) is extensively employed in the Northern States as a pasture grass, especially on low, damp grounds. In Pennsylvania it is called Herd's-grass, which name in the Northern States is applied to quite a different grass. Red-top is native both in this country and in England, where it is called Bent-grass. Two other nearly-related species, the White Bent-grass (*Agrostis alba*, L.), and the Brown Bent-grass, (*Agrostis canina*, L.) are occasionally found in meadows mixed with common Red-top, and they also are native in some localities in this country. All the species of *Agrostis* have one-flowered spikelets, in open panicles. Red-top has its name from the reddish color of the flowers and flower branches, which color is very peculiar and distinctive when a large quantity, or a field, is seen at once. The stems are erect, round and smooth, and the roots creeping.

As a grass for hay-making the Herd's-grass, or Timothy (*Phleum pratense*, L.), is more extensively employed than any other. Its solid stems, and tall, vigorous growth, give a large product of highly nutritive hay. Its flowers are arranged in a compact, cylindrical spike, usually three or four inches long. The spikelets are single-flowered, of two stiff-pointed glumes, including two much smaller and shorter palets. This grass has been introduced from Europe, where it is native, and also extensively cultivated under the name of Cat's-tail grass.

On the high mountains of New Hampshire, and also on the Rocky Mountains, we have a native species closely related to the Timothy, viz.: *Phleum alpinum*, L., or what might be called the Alpine Timothy. In Europe there are also several other species belonging to this genus, none of which, however, have been cultivated.

THE HONEY LOCUST.

(*Gleditschia triacanthos*, L.)

The Honey Locust is a well known tree, principally of the Western and Southern States. It is one of our largest forest trees, the trunk frequently attaining a diameter of three or four feet; but, from its habit of early dividing up into large branches, it does not attain as great height as many smaller trees. It usually forms a broad, open head, with a beautiful light-green foliage, which waves gracefully in the summer breeze.

Its trunk and limbs are usually beset with numerous horrible spines, or thorns, from three to six inches long, each of which has commonly two branches, whence the specific name *triacanthos*, or three-thorned. These thorns, however, are not constant, as trees are occasionally found which are entirely smooth. Some have supposed these were a different species, but they are in all other respects like the thorny kind, and the seed of either will produce thorny and thornless trees.

The favorite locality of the Honey Locust is in bottom lands, or following the course of small streams. It belongs to the Pea family (Natural Order *Leguminosæ*), but not to the same section as the Black Locust, which has true papilionaceous flowers. Its relationship in the Pea family would not be suspected from the appearance of the flowers, but its pinnate leaves and long pods, or true legumes, easily identify it.

In its flowering habit it is polygamous—that is, the fertile and infertile flowers are either separate or variously mixed on the same tree. The flowers are small and inconspicuous, in short spikes, proceeding from the axils of the leaves.

The fertile ones produce flat, twisted pods, a foot or more in length, and an inch and a half broad, and containing twenty or more pretty large, flat seeds. The pinnate leaves, four to six inches long, are made up of about ten pairs of small oblong leaflets, which are nearly entire on the margin. The pods contain a sweetish pulp, which is said to be employed in some of the Southern States in fermenting a kind of beer.

The tree is a vigorous grower, with a pretty dense, tough-grained wood, which makes excellent fuel. It is not much in request as an ornamental tree, perhaps on account of its formidable thorns, but has been employed to make hedges, and by some is thought to be superior for that purpose to the Osage. It has also been recommended for timber plantations.

THE WOODY COMPOSITÆ.

Perhaps no family of plants is more numerous in species than that of the so-called Compound flowers (*Compositæ*).

In all that part of the country lying east of the Mississippi there is not a shrub or tree belonging to this family. Some kinds, as various species of Sunflower (*Helianthus*), produce annually a large and heavy growth, but it invariably dies down to the ground at the approach of winter. The roots of many are perennial, but nothing above ground survives a season's growth.

It is not so, however, with several kinds of *Compositæ* in the region of the Rocky Mountains, and particularly in the great basins of the western slope. These are various species of *Artemesia* and *Linosyris*, all generally classed under the name of Sage brush; and they form a prominent and distinctive feature of the Plains, and in some measure by their woody growth compensate for the absence of trees.

The largest and most common Sage brush is the *Artemesia tridentata*, Nutt. It is very variable in size; on dry upland plains not usually over two or three feet high, with a trunk two or three inches in diameter. In valleys and moist ground it often attains a height of eight to ten feet, with a thickness of as many inches. Usually there are a number of stems spreading out from one root. The wood is light and porous, somewhat resembling cedar, and it burns readily even in a green state, as also do the leaves, with a pleasant balsamic fragrance. It is the main dependence, for fuel, of immigrants and travellers on the Plains west of the mountain ranges. It has no resemblance to our cultivated Sage-plant, except in its fragrance, and belongs to an entirely different family. Its annual growth is very slow. We have often cut bushes of moderate size which indicated forty or fifty years' age, and undoubtedly many of them continue to grow for a century.

Another species, the *Artemesia cana*, Pursh., is seldom found away from rich moist valleys. It sends up more numerous stalks from one root, *i. e.*, it grows in bushy clumps of twenty or thirty stalks, which are each about an inch in diameter.

Still another species is the *Artemesia arbuscula*, Nutt. This is very dwarf in habit, seldom growing over a foot high, but often covering hundreds of acres on low mountain slopes.

The bushes of *Linosyrus* are quite similar in general habit to those of the *Artemesia*, but do not grow as large. There are also several species of that genus.

NEW BOOK.

THE AMERICAN BOTANIST AND FLORIST. By ALPHONSO WOOD, A. M., author of the Class Book of Botany, &c. A. S. Barnes & Co., New York and Chicago.

This is a handsome, well-printed volume of nearly 600 pages, possessing some features of great merit. The part devoted to structural and physiological botany is an example of great condensation, and is profusely illustrated. The definitions are generally very clear and concise. In some instances, we think, technical names are unnecessarily employed, as for instance, *pleurenchyma* instead of *fibrous tissue*, and *trachyenchyma* instead of *vascular tissue*. Where English words will convey the idea intended, we think they should be employed in preference to foreign ones; thus *head* is a better word than *capitulum*, and *cluster* is to be preferred to *glomerule*, etc.

The portion of the volume devoted to descriptive botany professes to record the characters of nearly 4,000 species of the native and cultivated plants of the United States east of the Mississippi river. The introduction of greenhouse exotics is, we think, carried too far; for instance, we have given us fifteen species of Begonia, a genus of which we have no native representative. As an accommodation to city classes, whose acquaintance with plants is mostly limited to the cultivated exotics, this may be well enough, but for students wishing to study the productions of their own country, we think this matter is superfluous, and that its space would be better filled by expanding the descriptions of our native plants.

FERNS AND MOSSES.—The Ferns and Mosses are beautiful objects and well deserving the study of young ladies. Good specimens are finely adapted to parlor collections for ornament as well as for study. There are about sixty species of ferns in the Northern States. Many of them are very delicate and beautiful. The fructification is generally in small dots or lines on the back of the leaves.

From New York.—You ask for some botanical notes from this part of our great country. Vegetation is yet mostly dormant, and we must confine ourselves to anticipation of what Nature will soon present. Here and there, however, in warm sheltered spots, by brushing away the masses of fallen leaves we may recognize some of our early spring flowers nearly ready to burst forth into life and beauty. Among these is the Liverleaf (*Hepatica*), the Spring Beauty (*Claytonia Caroliniana*), and several kinds of violets.

Of the violets I must speak a little at large, although it is yet too early for their appearance. The commonest, and perhaps the most beautiful, is a blue violet growing in wet or damp grounds, especially in meadows and by the borders of brooks and streams, the *Viola cucullata*, Ait., which rendered into English means the Hooded violet, from the manner in which the young leaves are rolled together in the form of a hood. The color of this violet is quite variable, from a light sky-blue to a dark purple, but always bright and attractive. Next we have, in low or wet grounds, the small White violet (*Viola blanda*, Willd.), with roundish, heart-shaped, or kidney-shaped leaves, and delicate white flowers on short stalks, seldom rising more than an inch or two from the ground. Then we have the low yellow violet (*Viola rotundifolia*. Mich.), which is found on wooded slopes and hill sides. This has small, bright yellow flowers, opening in early spring. The leaves, at the time of flowering, are about an inch broad and nearly round, but when fully grown they are often three or four inches across. The three species we have mentioned are stemless violets, the leaves and flowers springing separately from the root or root-stock.

Of the stemmed violets we have a number of species. In damp shady places the low leafy blue violet, a variety of *Viola canina*, L., or the *Viola Muhlenbergii*, Torr., the Long-spurred violet (*Viola rostrata*, Pursh.), in rich soils on wooded hills, the Striped-flowered violet (*Viola striata*, Ait.), and the large white violet (*Viola canadensis*, L.), which is the largest species we have in the country, common in rich, open woods, the flowers of good size, whitish, and delicately tinged with violet. Lastly, we have the large yellow violet (*Viola pubescens*, Ait.) which is common in open, and especially in sandy woods.

I was much pleased the other day, in crossing a low place in a meadow, to observe the young flower-stalks, or spathes, of the Skunk Cabbage (*Symplocarpus fœtidus*, Salisb.) just shooting into sight. With a knife I cut down into the ground, and severed some of these from the root, that I might examine their very singular structure. They consist of a roundish mass, or head, in which grow many small crowded yellowish flowers, the whole surrounded by a thick, leathery kind of leaf, of a purplish color, spotted and striped with yellow and green, and extending beyond the cob, or head of flowers, enwrapping and almost entirely concealing them from view. The young leaves are already beginning to press out of the ground, and when fully developed they form a mass of large heart-shaped leaves, looking not unlike a head of cabbage, and, from their strong and peculiar odor, meriting the name by which it is generally known. A plant of such offensive odor should have some compensating qualities, and we find that the root of this plant has a pretty well established reputation in the Materia Medica.

Meagre as is the botanizing field among the flowering plants at present, we find it little more satisfactory among cryptogams. Several kinds of mosses have found warmth sufficient to make some growth, and send up fruiting pedicels and mature capsules. On the bodies of trees are several species of *Orthotrichum* (particularly *O. strangulatum*, Beauv., and *O. crispum*, Hedw.) in little round patches, and occasionally large masses of the handsome *Neckera pennata*, Hedw. I often gather this in fine condition on the beech wood which is brought into market. Various other kinds of mosses are still under beds of snow, where they find conditions favorable to their growth, and when their fleecy covers are melted away they will please the eye with their bright and lively colors, and repay tenfold any labor taken in a close examination. These small delicate objects are worthy of more careful study. P.

UTICA, N. Y., April, 1870.

ANSWERS TO CORRESPONDENTS.

Plants to Name—*Mrs. B. S. Lake, Colorado.*—It is a pleasure to look upon such finely preserved specimens as the Colorado plants you send. No. 1 is the sky-blue Columbine (*Aquilegia cerulea*, Torr.), one of the finest ornaments of the Rocky Mountains. The flowers are larger and more showy than either the garden Columbine (*A. vulgaris*, L.) or the wild Columbine (*A. canadensis*, L.) of the Eastern States. It grows about two feet high, has large bright blue flowers, the spur of the petals being two inches long. It is well worthy of cultivation. No. 2 is the smooth Mountain Maple (*Acer glabrum*, Torr.) It is a small shrub, six to eight or ten feet high, with small smooth leaves, somewhat three-lobed and toothed, and producing an abundance of the winged fruit peculiar to the maples. No. 3 is *Oxytropis Lamberti*, Pursh., without any common name so far as we are aware. It belongs to the Pea Family (*Leguminosæ*). It is a low plant with perennial root, bearing all the leaves at the ground and sending up simple spikes of flowers, varying from light blue to purple, which are succeeded by upright cylindrical pods about an inch long. The plant is wide-spread over the plains and among the lower mountain ranges. No. 4 is a shrub peculiar to the Rocky Mountains, nearly related to the Hydrangea, and is botanically known as *Jamesia Americana*, T. and G., in honor of the discoverer, Dr. James, the Botanist of Long's Expedition in 1820. No. 5 is a plant well known in the Western States, occurring in hazel patches and the borders of prairies, and is sometimes called Shooting Star, sometimes Pride of the Prairie (*Dodecatheon Meadia*, L.) It is a unique and beautiful plant of the Primrose Family. We do not mean the *Evening Primrose* Family, but the *true* Primrose Family (*Primulaceæ*). The type of this family is the Primrose of Europe, of which genus we have but two species (both rare) in this country. The Dodecatheon has a number of large, oblong, smooth leaves at the surface of the ground, from which rises a long naked stem a foot or two in length, and surmounted at the top with an umbel of from five to twenty flowers, which are nodding when fully open, but in fruit are strictly erect. It has been somewhat introduced into cultivation, and is well worthy a place in every garden.

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EDITORS:
CHAS. V. RILEY,
DR. GEO. VASEY.

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Entomological Department.

CHARLES V. RILEY, EDITOR,
221 N. Main st., St. Louis, Mo.

THE ONWARD MARCH OF THE COLORADO POTATO BEETLE.

A WORD TO OUR CANADIAN NEIGHBORS.

Last July, while spending a few days in Ontario, we ascertained that this most destructive insect had just invaded the Dominion at two different points, namely, near Point Edward, at the extreme south of Lake Huron, and opposite Detroit, near Windsor, at the southwestern corner of Lake St. Clair. These are precisely the two points at which we should naturally expect to first meet with it on the Canadian border; for all such beetles as fly into either of the lakes from the Michigan side would naturally be drifted to these points. As we know from experience, many insects that are either quite rare, or entirely unknown, on the western side of Lake Michigan are frequently washed up along the Lake shore at Chicago; and these are so often alive and in good condition, and so often in great numbers, that the Lake shore is considered excellent collecting ground by entomologists. In like manner grasshoppers are often washed up on the shores of Salt Lake, in Utah, in such countless numbers that the stench from their decomposing bodies pollutes the atmosphere for miles around. We have not the least doubt, therefore, in view of these facts, that the Colorado Potato Beetle could survive a sufficient length of time to be drifted alive to Point Edward, if driven into Lake Huron anywhere within twenty or thirty miles of that place, or if beaten down anywhere within the same distance while attempting to cross the lake.

How truly is Mr. Walsh's prophecy being fulfilled, that the northern columns of this great army would spread far more rapidly than the lagging southern columns.*

* *Practical Entomologist*, I, p. 14.

Now, what will our Canadian brethren do? Will they stand by and listlessly see this pernicious insect spread over their territory like a devouring flame, as it has done over the Western and Central States; or will they make some determined and united effort to prevent such a catastrophe? Of one thing our friends across the border may rest assured—they have not here a sham and braggart Fenian army to deal with, but an army which knows no retreat, and whose members, though of small and insignificant stature, will fully make up in number what they lack in size.

When we calculate the immense loss, amounting to millions of dollars, which this insect has cost the Western States during the past nine or ten years—when we contrast the healthful and thrifty aspect of the potato fields in Ontario and in those States to which this potato plague has not yet spread, with the sickly, denuded, or Paris-green-besmeared fields at home—but above all when we reflect that, nothing preventing, it will infest the whole of Ontario within, perhaps, the next two, and at farthest within the next three, years—we feel that it is high time to make some effort to prevent its onward march through Ontario, if ever such an effort is to be made. The warnings and instructions given by the agricultural press, and through our own columns, will avail but little, as they reach the few only. It may be, and doubtless is, true that successful culture, as our country becomes more thickly settled, will be confined to the intelligent and well-informed; yet the fact nevertheless remains, that the masses will do nothing to ward off an evil until they are forced to it from necessity. The plodding, non-reading farmer will take no notice of the few bugs he first sees in his potato field, because they do him no material injury; but when the bugs have increased so as to make it a question of "potatoes or no potatoes" with him, then his energies will be aroused. But alas! his best efforts, at this time, often prove unavailing, and he has to spend days to accomplish that which a few minutes would have accomplished before. We therefore fully expect to see this great army of bugs continue its east-

ward march without hindrance, unless other preventive measures are taken than those already employed. A standing premium offered by the Minister of Agriculture, Mr. Carding, for a given number of beetles, or for the greatest number collected and killed in one season, or for the cleanest and best field of potatoes, of a given number of acres, within the infested districts along the eastern shores of the lakes mentioned and those of the St. Clair river; might, and undoubtedly would, be the best means of stamping it out, and of keeping it out of the Dominion.

No doubt that, in suggesting any expenditure of money for such purposes, our Canadian brethren will deem us over-enthusiastic about "small things," and over-anxious for their welfare. Well, be that as it may, we don't forget that there is considerable of Uncle Sam's territory beyond Niagara. It is a mere matter of dollars and cents, and we venture to say that, when once this insect shall have spread over Ontario, a million dollars would be freely spent to accomplish that which will then be almost impossible, and which a very few thousands would effectually accomplish now—namely, its extermination from the Dominion.

An excellent chance is now afforded in Ontario—almost surrounded as it is by lakes—to keep this destructive enemy at bay. In the summer of 1869, reports of this insect's ravages, and of its progress eastward, came thick from Wisconsin and Indiana; but no organized effort was made to check it, and indeed there was very little chance of doing so. It is now fast spreading through Ohio; and, according to Dr. Trimble of New Jersey, has already reached Pennsylvania. Uncle Sam can not well prevent its onward spread around the southern shore of Lake Erie, through Pennsylvania and eastward; but, if it can be effectually resisted between Point Edward and the Detroit river, there will be little difficulty in preventing its crossing at Niagara. A victory would indeed be gained if, by intelligent effort, this grievous pest could be kept out of Upper Canada, while it is devastating the potato fields on all sides in the States; and Minister Carding would add to his well-deserved popularity by making the effort, whether it succeeds or not.

PARIS GREEN AS A REMEDY.

While on this subject it may be well to say a few words about the use of Paris green. This substance has now become THE remedy for the Colorado Potato Beetle, and it is the best yet discovered. Having thoroughly tested it ourselves, and having seen it extensively used, we can freely say that, when applied judiciously, it is efficient and harmless. If used pure and too abundantly, it will kill the vines as effectually as would the bugs, for it is nothing but arsenite of copper (often called "Scheele's green" by druggists), and contains a varied proportion of arsenious acid, according to its quality—often as much as 59 per cent., according to Brande & Taylor. But when used with six to twelve parts, either of flour, ashes, plaster or slacked lime, it causes no serious injury to the foliage, and just as effectually kills the bugs. The varied success attending its use, as reported through our many agricultural papers, must be attributed to the difference in the quality of the drug.

We hear many fears expressed that this poison may be washed into the soil, absorbed by the rootlets of the plant, and thus poison the tubers: but persons who entertain such fears forget that they themselves often apply to the ground, as nourishment for the vines, either animal, vegetable or mineral substances that are nauseous, or even poisonous to us. Animal and vegetable substances, of whatsoever nature, must be essentially changed in character and rendered harmless before they can be converted into healthy tubers, and a mineral poison could only do harm by being taken with the potatoes to the table. That any substance, sprinkled either on the vines or on the ground, would ever accompany to the table a vegetable which develops underground, and which is always well cooked before use, is rendered highly improbable. There can be no danger in the use of sound tubers. But the wise and well-informed cultivator will seldom need to have recourse to Paris green, as he will find it more profitable to use the different preventive measures that have from time to time been recommended in these columns.

The poison may do harm, however, by being carelessly used, and it is most safely applied when attached to the end of a stick several feet long, and should not be used where children are likely to play.

NATURAL CHECKS INCREASING.

In many parts of the West this insect is being kept in due check by its cannibal and parasitic enemies, which are still increasing. Thus we learn from many sources, that in Iowa and Kansas it is not nearly so injurious as it formerly was, while in some parts of Illinois and Missouri it has also become less troublesome. Last year Mr. T. Glover published the fact that the Great Lebia (*Lebia grandis*, Hentz, Fig.

[Fig. 181.]

Colors—Yellowish-brown and dark-blue.

181) was found devouring its larvæ,* and though hitherto considered rare this Lebia has suddenly fallen upon it the present year in many parts of Missouri. During a recent trip along the Missouri Bottom we found this cannibal very abundant in some potato fields belonging to Mr. Wm. Coleman, where it was actively engaged in destroying both the eggs and larvæ of the Potato Beetles. The head, thorax and legs of this cannibal are yellowish-brown, in high contrast with its dark-blue wing-covers.

This makes fourteen conspicuous enemies of our Colorado Potato Beetle which we have figured, and a dozen more, mostly of small size and inconspicuous markings, might easily be added to the list. Moreover, chickens have learned to relish the eggs, and have even acquired a taste for the young larvæ. So we need not wonder that the army is being decimated in those States first invaded by it.

BOGUS EXPERIMENTS.

It was recently reported to us that a neighbor had succeeded in driving away all his Potato bugs by strewing Elder branches among the vines. We went to examine the field, and found our friend enthusiastic over his discovery; and indeed, though the vines were nearly devoured, there were but a few full grown larvæ to be found. But, as he could not tell us what had become of the "slugs," we undertook to show him where they had gone, and after digging a few moments with a trowel, unearthed dozens of them, the majority in the pupa, but a few yet in the larva state. Our neighbor had, in fact, been misled by appearances, for want of better knowledge of his enemy. The larvæ as they acquired their growth suddenly became so destructive, that to save his vines he was obliged to try some means of killing them, and as an experiment he tried the Elder. The larvæ were just ready to disappear of their own accord, and as the great bulk of them did really disappear in two or three days after the application, the apparently logical inference was made that they had been driven away by the smell of the Elder.

How many of the published remedies that flood the country owe their origin to just such defective proof! The sun-scorching remedy, which consists of knocking the bugs off the vines on to the heated ground between the rows, and which has been so often recommended the present year, partakes a good deal of this character; for it can only be of benefit in a very dry season, and at a time of year when the bugs have done most of their damage. A goodly proportion of the larvæ that are thus knocked off will always manage to burrow into the ground and transform, or to get back upon the vines; and

THE TRUE REMEDY

consists in preventing them from becoming numerous so late in the season. Watch for the beetles in early spring, when the vines are just peeping out of the ground. Ensnare as many of them as you can before they get a chance to pair, by making a few small heaps of potatoes in the field planted: to these the beetles will be attracted for food, and you can easily kill them in the morning. Keep an eagle eye for the eggs which are first deposited. Cultivate well, by frequently stirring the soil. Surround your fields on the outside by rows of such tender-leaved varieties as the Mercer, Shaker Russet and Early Goodrich; but, above all, isolate your potato field as much as possible, either by using land surrounded with timber, or by planting in the centre of a corn field. Carry out these suggestions thoroughly and you will not have much use for Paris green, and still less for the scorching remedy.

*Dept. of Agr. Rep. 1868, p. 81.

[From the Missouri Entomological Report for 1869.]

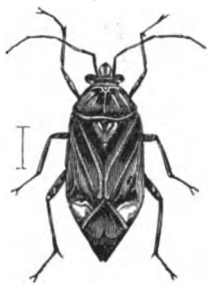
THE TARNISHED PLANT-BUG.

(*Capsus oblineatus*, Say.*)

[HETEROPTERA CAPSIDÆ.]

Quite early last spring while entomologizing in Southern Illinois, I spent a day with Mr. E. J. Ayres, of Villa Ridge, and was surprised to learn that he had become quite discouraged in his efforts to grow young pear trees, on account of the injuries of a certain bug, which, upon examination, I found to be the Tarnished Plant-bug, represented enlarged at Figure 182, the hair line at its side showing the natural size. The family to which this bug belongs is the next in a natural arrangement to that which includes the notorious Chinch-bug, and the insect is, like that species, a veritable bug, and obtains its food by *sucking* and not *biting*. The *Capsus* family is a very large one, containing numerous species in this country, but among them, none but the species under consideration have thrust themselves upon public notice by their evil doings.

[Fig. 182.]



*This bug was originally described by Beauvois as *Coreus lineolaris*, but, according to Mr. Uhler, that author names it *linearis* under his plate. It was subsequently described as *Capsus oblineatus*, Say. Harris, in speaking of it, refers it to the genus *Phytocoris*, and popularly calls it the "Little-lined Plant-bug." It in reality belongs to Fieber's genus *Lygus*. As Say's description is the only one I have access to, I have retained the name he gave it as being eminently appropriate.

The Tarnished Plant-bug is a very general feeder, attacking very many kinds of herbaceous plants, such as dahlias, asters, marigolds, balsams, cabbages, potatoes, turnips, etc.; and several trees, such as apple, pear, plum, quince, and cherry. Its puncture seems to have a peculiarly poisonous effect, on which account, and from its great numbers, it often proves a really formidable foe. It is especially hard on young pear and quince trees, causing the tender leaves and the young shoots and twigs to turn black as though they had been burned by fire. On old trees it is not so common, though it frequently congregates on such as are in bearing, and causes the young fruit to wither and drop. I have passed through potato-fields along the Iron Mountain Railroad in May, and found almost every stalk blighted and black from the thrusts of its poisonous beak, and it is not at all surprising that this bug was some years ago actually accused of being the cause of the dreaded potato-rot.

This Bug is a very variable species, the males being generally much darker than the females. The more common color of the dried cabinet specimens is a dirty yellow, variegated as in the figure with black and dark brown, and one of the most characteristic marks is a yellow V, sometimes looking more like a Y, or indicated by three simple dots, on the scutel (the little triangular piece on the middle of the back, behind the thorax). The color of the living specimens is much fresher, and frequently inclines to olive-green. The thorax, which is finely punctured, is always narrowly bordered and divided down the middle with yellow, and each of the divisions contains two broader longitudinal yellow lines, very frequently obsolete behind. The thighs always have two dark bands or rings near their tips.

As soon as vegetation starts in the spring, the matured bugs, which winter over in all manner of sheltered places, may be seen collecting on the various plants which have been mentioned. Early in the morning they may be found buried between the expanding leaves, and at this time they are sluggish, and may be shaken down and destroyed; but as the sun gets warmer, they become more active, and when approached, dodge from one side of the plant to the other, or else take wing and fly away. They deposit their eggs and breed on the plants, and the young and old bugs together may be noticed through most of the summer months. The young bugs are perfectly green, but in other respects do not differ from their parents except in lacking wings. they hide between the flower-petals, stems and leaves of different plants, and are not easily detected. Late in the fall, none but full grown and winged bugs are to be met with, but whether one or two generations are produced during the season I have not fully ascertained, though in all probability there are two.

Remedies.—In the great majority of cases, we are enabled to counteract the injurious work of noxious insects the moment we thoroughly comprehend their habits and peculiarities. But there are a few which almost defy our efforts. The Tarnished Plant-bug belongs to this last class, for we are almost powerless before it, from the fact that it breeds and abounds on such a great variety of plants and weeds, and that it flies so readily from one to the other. Its flight is, however, limited, and there can be no better prophylactic treatment than clean culture; for the principal damage is occasioned by the old bugs when they leave their winter quarters and congregate on the tender buds and leaves of young fruit stock; and the fewer weeds there are to nourish them during the summer and protect them during the winter, the fewer bugs there will be. The small birds must also be encouraged. Applications of air-slacked lime and sulphur have been recommended to keep them off but if any application of this kind is used, I incline to think that, to be effectual, it must be of a fluid nature; and should recommend strong tobacco-water, quassia-water, vinegar, and cresylic soap. Some persons who have used the last compound have complained that it injures the plants, and every one using it should bear in mind what was stated in the preface to my First Report, namely, that the pure acid, no matter how much diluted with water, will separate when sprinkled, and burn holes in, and discolor plant texture; while if properly used as a saponaceous wash it will have no such injurious effect. It must likewise be borne in mind, that the so-called "plant-protector," which is a soap made of the same acid, will bear very much diluting (say one part of the soap to fifty or even one hundred parts of water), and that it will injure tender leaved plants if used too strong. I have noticed that the bugs are extremely fond of congregating upon the bright yellow flowers of the Cabbage, which, as every one knows, blooms very early in the season; and it would be advisable for persons who have been seriously troubled with this bug, and who live in a sufficiently southern latitude where the plant will not winter-kill, to let a patch of cabbages run wild and go to seed in some remote corner of the farm, in order that the bugs may be attracted thither and more readily destroyed than when scattered over a larger area.

[This insect has been very injurious the present year, and by request we give the above account of it. Mr. J. P. Jones, of Keytesville, Chariton county, Mo., complained bitterly to us this spring of its injuries to pear and apple trees in his section; and later in the season we found our friend H. D. Emery, of Chicago, almost baffled by its injurious punctures in his efforts to raise late-planted cucumbers. Mr. D. B. Wier, of Lacon, Ills., considers that it has damaged his crops to the amount of $1,000; and the *ad interim* committee, which lately visited his orchards, report but little fruit on the pear trees on account of its having poisoned and killed the blossom buds. No doubt the extreme dry weather has had much to do with the increase of these pests. Mr. Ayres tried many applications of different kinds this spring to ward them off, but even some cresylic soap, which we sent him for that express purpose, proved ineffectual, as the following experience will show. He writes, April 12,'70:

I first tried it according to directions—one pound of the soap to ten gallons of water—and it was impossible to kill the bugs with it except by drowning; and they would swim in it an unaccountably long time before they would die. I then doubled the strength, using one pound of the soap to five gallons of water. After immersing one of them in this twice, he would get dry and fly away; but by keeping him wet with it for ten minutes, it would finally kill him. I am inclined to believe that it will not kill insects or keep them off the trees, unless made strong enough to kill the trees also. I thoroughly saturated several rows of trees with it at the strength above stated, and three hours afterward found the bugs as thick as ever, and sucking away at the buds and leaves as if nothing had happened.

Not discouraged by this want of success, Mr. A. afterwards went over all his pear trees, about 2,000 in number, with a basin of soap-suds early in the morning, and shaking each branch, caused the bugs to fall into the water. It took about three hours' time of three men, and by commencing early they were enabled to get through before it got warm enough for the bugs to become active. After pursuing this course for three successive mornings, during which time many thousands were killed, he had the satisfaction of seeing his trees unmolested, and thus saved. From the fact that these bugs suck the sap from, and do not masticate the plant, we have found the poisonous applications which are so effectual in killing many other insects of no avail here; and there is no better way of killing them at present known than by shaking them off early in the morning. It will also be well to bear in mind that, as they winter mostly in the woods, they are at first found most numerous on the outside of our fields and orchards.]

OSAGE ORANGE FOR THE MULBERRY SILK-WORM.

UTAH COUNTY, UTAH.—Having been engaged in silk culture for three years past, I take the liberty of submitting to you a report of what I have done.

In 1867 the Hon. Albert K. Thurber, of this place, on his return from a visit to London, England, presented me with a few silk-worm eggs of the old French variety. They made sixteen cocoons, producing three female moths. The following year I raised five hundred worms, but not having sufficient mulberry leaves to feed them, I fed part of them on Osage orange; they ate it with avidity, all did well, and made cocoons of good size and color. Last season (1869) I fed five thousand worms on Osage orange, and they made five thousand cocoons. This season I am feeding ten thousand worms on Osage orange, and they are doing well. I would here remark that I have never found a diseased worm since I commenced raising silk.

I have fed a portion of my worms each season on mulberry and a portion on Osage orange, and those fed on the latter have thrived and done as well as those fed on the former. I do not suppose Osage orange is preferable to mulberry to feed silk-worms, but it may be of importance to some to know that they will do well upon it. I have fed worms on the two kinds of feed in close proximity, and have known them to leave the mulberry and go to the Osage orange. The dryness of our climate and the absence of thunder storms during the feeding season render Utah particularly adapted to the raising of silk, and perhaps may be more favorable for feeding Osage orange than a moist climate.

Not having sufficient knowledge of the quality of silk to test it, I sent some cocoons to Mr. Muller, of Nevada City, California, to be reeled and tested, and he reports that the silk is, to all appearances, strong and of excellent quality. I intend to make a business of silk culture as fast as circumstances will permit.

[Professor Glover, of this Department, four years since fed the silk-worm (Bombyx mori) with the Osage orange with success corresponding with the above experiment.]—*Monthly Rep. Dept. Agriculture for May and June.*

[When facts of such vital importance as these are published, they lose the greater part of their significance by having no signature. No one can rely on statements of this character when given in such a mythical manner. Five thousand cocoons from five thousand worms is something so unusual and unprecedented, that, under the circumstances, one is warranted in discrediting the statement. Prof. Glover, it seems to us, would have given weight to the above item by attaching the date and the writer's name. We thoroughly experimented with Osage orange this summer, but could not succeed in making any worms spin up on it, though some few were fed into the last stage.—ED.]

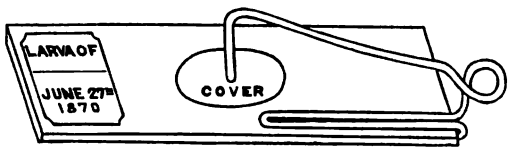
☞ The Colorado Potato Beetle is said to be doing more damage than ever in Minnesota.

HOW TO COLLECT AND STUDY INSECTS—No. 5.

BY F. G. SANBORN, BOSTON, MASS.

While speaking of the microscope and its uses in studying living insects, I should mention a method of preparing specimens and fragments illustrating the structure or anatomy of these minute beings, so that they may be preserved indefinitely for future use. The ordinary size of a "slide" for the microscope is, as I previously said, three inches in length by one in breadth. The slide should be cut from clear and rather thin glass, free from flaws and air-bubbles, and a few dozen should be kept constantly on hand; they can be easily and cheaply got out by any glazier from his waste slips. If the student wishes to have them finely finished, he can grind the edges smooth upon an emery wheel, a common grindstone, or even upon a flat surface with emery powder and water, at the expense of a little more time and labor. The "covers" will cost him rather more care, as the exceedingly thin glass which is prepared for this purpose is not to be procured except in large cities, where an ounce of circular covers of various sizes generally costs about three dollars. The thinnest glass he can procure will answer for many objects if clear; and even mica, which separates readily into thin plates, and can be readily cut with scissors, serves a very useful purpose, although liable to injury from scratches. The covers need not be round; square or oblong ones are just as good. Cut on an average one-half inch square; few will be required larger, and the majority of specimens will be covered by a one-quarter inch cover. Having a supply of these ready for use, obtain a vial of fir or "Canada" balsam, thin it with chloroform and keep tightly corked. Whenever a small insect, a mite, a gnat, or a young larva, just from the egg, is to be preserved, place it upon the centre of a clean glass slide, let a drop of the balsam fall upon it, and apply the cover. A little experience will enable one to avoid "air-bubbles" and such inconveniences, and show how long the preparation requires to dry and harden, as well as what weight to apply to the cover. English operators use a very effective and simple contrivance

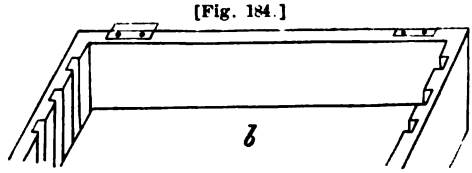
[Fig. 183.]



a

of wire as in Figure 183, and easily made of different powers of compression suitable to the object. The specimens thus prepared should be kept in boxes lined with grooved slips of wood as in Figure 184, having the grooves op-

[Fig. 184.]



posite, and of such depth and distance apart as to keep the slides separate and safe from breakage. The slides may be numbered or labelled on the glass with a diamond, or bit of hard stone, such as a quartz crystal; or have paper "adhesive tags" pasted on one end, as in our sketch, according to the taste and skill of the student. To return to our collecting. Let us follow the course of this old stone wall, from which have fallen at various times numbers of loose rocks; under many of these will be found forms of life to repay a careful search. But here on the very top of the wall is a crawling thing which we drop into our vial of alcohol with some little repugnance at the touch. "An Earwig?" Not precisely, but sometimes improperly so called. It is not even a true insect, but belongs to the Centipede family of articulated or jointed animals. As you will see, it has too many feet for an insect, or even the larva of an insect. Some naturalists would by a careless use of terms consider it an insect, but we prefer, in accordance with the laws of priority, to confine that title to the true three-jointed articulates which have in the adult condition six legs only. This, as you see, has many joints or segments, and numerous feet, although full grown. The Class to which it pertains is called *Myriapoda*, or many-footed animals, from this *feat*-ure (no pun intended) of its structure; and this species, *Lithobius americanus*, or the American dweller under stones, is very much unlike the true Earwig, *Forficula*, in everything but color, and is very abundant throughout the United States in damp localities beneath stones and logs. In fact, we should not have seen this specimen so high above the ground were it not for the moist condition of the lichen-covered wall after the recent shower. Here are others of the same kind beneath this stone, and a coiled *Myriapoda* looking like a small shell, closely related to the preceding, but very cylindrical and with a much harder covering; as we disturb it, and it endeavors to make its escape, you perceive that its feet are still more numerous than those of *Lithobius*, and move with a very beautiful continuous undulating motion along the sides, reminding one of ripples passing along the sides of a boat.

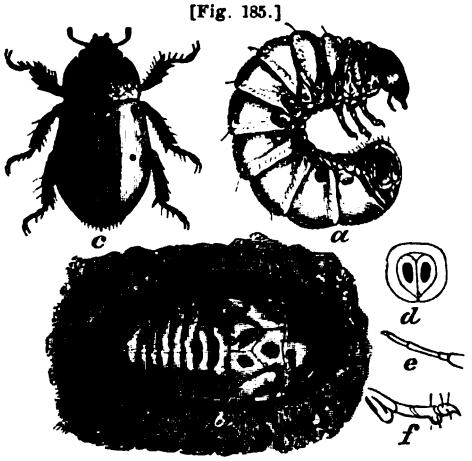
Its name is *Iulus*, and from its form and hardness it is known in some sections of our country as the "wire-worm." The true "wire-worms," baptized long before, however, are the larvæ of the Snapping-beetles, or Elaters. This *Iulus* will preserve well in alcohol.

INSECTS INJURIOUS TO THE GRAPE-VINE.—No. 11.

The Spotted Pelidnota.

(*Pelidrota punctata*, Linnæus.)

[Fig. 185.]



Colors—(*a*) glassy-white; (*b*) yellowish; (*c*) clay-yellow with black spots.

This is the largest and most conspicuous beetle that attacks the foliage of the Grape-vine, and in the beetle state it seems to subsist entirely on the leaves of this plant, and of the closely allied Virginia Creeper. Though some years it becomes so abundant as to badly riddle the foliage of our vineyards, yet such instances are exceptional; and it usually occurs in such small numbers, and is so large and clumsy, that it can not be considered a very redoubtable enemy.

Its larva has, for a number of years, been known to feed on the decaying roots of different trees, but has never, so far as we are aware, been described, for which reason we append below a description of it. It is a large clumsy grub (Fig. 185, *a*) bearing a close resemblance to the common White Grub of our meadows, and differs from that species principally in being less wrinkled, and in having the chitinous covering (or skin, so-called) more polished and of a purer white color, and in the distinct heart-shaped swelling above the anus (Fig. 185, *d*). Towards the latter part of June we have found this larva in abundance, in company with the pupa (Fig. 185, *b*), in rotten stumps and roots of the Pear. In preparing for the pupa state, the larva forms a rather unsubstantial cocoon of its own excrement, mixed with the surrounding wood. The pupa state lasts but from eight to ten days, and the beetle (Fig. 185, *c*) is found on our vines during the months of July, August and September. It is not yet known how long a time is required for the development of the larva, but from analogy we may infer that the insect lives in that state upwards of three years.

This beetle was named about a century ago by Linnæus, who met with a specimen in the magnificent collection of shells and insects belonging to Queen Louise Ulrica of Sweden. It occurs throughout the States and Upper Canada, and is even met with in the West Indies. It flies and feeds by day. The wing-covers are of a slightly metallic clay-yellow color, with three distinct black spots on each, and the wings themselves are dark-brown inclining to black; the thorax is usually a little darker than the wing-covers, with one spot each side; the abdomen beneath, and legs, are of a bronzed-green. It is easily kept in check by hand-picking.

PELIDNOTA PUNCTATA, Linn.—*Larva* (Fig. 185, *a*)—Length 2 inches; clumsy, moving on the side. *Head*, bright chestnut-brown, smooth, rounded, with a short, impressed, longitudinal line on the top, and three shallow impressions in front; epistoma trapezoidal and darker; labrum rough, irregularly punctate, and beset on the margin with a few stiff rufous hairs; antennæ (Fig. 185, *e*) as long as epistoma and labrum together, 4-jointed exclusive of bulbus or tubercle in which they are inserted; joints cylindrical, proportioned in length as 2, 6, 4, 1, the terminal joint being often a mere bud; mandibles strong and black, with three denticulations at tip, and a very slight tooth at inner basal portion; maxillæ brown and subcylindrical on outside, angulated on inside, bearing two lobes, each terminating in an inwardly curved coriaceous tooth, and each furnished on their inner narrow edge with stiff bristles, the outside one arising close by base of palpus, the inside one extending lower down, and recalling, by its form, the terminal joint of the front leg of a scorpion; maxillary palpi 4-jointed, joints cylindrical, short, very gradually longer and longer from 1 to 4, the terminal joint more pointed and narrower than the others; labium quadrangular, labial palpi 2-jointed, the palpigerous piece strongly beset with bristles. *Body*, smooth with but a few wrinkles on thorax; polished translucent white, with faint bluish marblings on all but thoracic joints, which are slightly narrower than the rest; a narrow vesicular dorsal line, and a very slight yellowish horny plate in a depression on joint 1; a very slight pubescence observable, and a transverse tergal row of sparse but tolerably long hairs on posterior part of each joint; more dense and conspicuous hairs on lower sides of anal joint, which joint is short, cut off squarely, with a heart-shaped swelling (Fig. 185, *d*) sunk into a circular depression, each lobe of the heart with a darker oval coriaceous elevation; spiracles sub-elliptical, dark chestnut-brown, placed on a prominent swelling, the lateral openings *all* facing the head, the 1st on joint 1, the rest on joints 4, 5, 6, 7, 8, 9, 10 and 11, gradually becoming smaller and smaller from first to last. *Legs* (Fig. 185, *f*) horny, light-brown and covered sparsely with hairs; coxæ long and stout, with a rounded swelling at lower anterior edge; femora cylindrical, sometimes distinctly, at others indistinctly, separated from tibiæ, sometimes prolonged into a thorn below, with a distinct carina along the inside, at others not; tibiæ cylindrical, incrassated anteriorly, especially below; tarsi cylindrical and terminating in a distinct claw.

Pupa (Fig. 185, *b*) of the form of *Lachnosterna*.

Described from 12 living specimens.

☞ We learn that the Chinch Bug did much damage in some parts of Illinois and Wisconsin during the dry weather.

☞ Upwards of 1,200 lbs. of Paris green have been sold at LaCrosse this season for the destruction of potato bugs.

THE SLUG ON PEAR AND CHERRY TREES.

"The insect generally called the pear or cherry tree slug (*Selandria cerasi*, Peck) has in our grounds been so few and so little injurious this season that we had almost forgotten to notice it, until, passing the orchard of one of our neighbors a few days since, we saw his pear trees almost entirely denuded of their foliage by reason of the slug. It is a little singular that any cultivator can neglect to guard against such results, when merely dusting the foliage with lime, plaster, or even the ordinary dry soil, will at once destroy the insect. The first brood is now about over, but a second one may be looked for from the fifteenth to the last of this month, and they should be carefully watched for and destroyed by all who wish health and vigor to their young pear or cherry trees."

The above is from a correspondent of the *Journal of Agriculture*, who writes over the signature of "Addi," and whose articles abound in common sense, and are usually very correct; but, in stating that the Pear and Cherry Slug can at once be destroyed by ordinary road dust he has made a very pardonable error, and has been deluded either by hasty observation or by the unreliable testimony of others.

Though not very troublesome in the West, this insect often does much damage in the more eastern States, and it has this year absolutely stripped many orchards of every vestige of green along the line of the Michigan Central railroad, leaving nothing but the seared and yellow leaf robbed of its parenchyma. We found that the popular remedy was sand, there being an abundance of this commodity along the Lakes; but, as our friend Mr. Wm. Saunders, of London, Ontario, has abundantly demonstrated, and as we have ourselves proved, simple sand does not kill. It sticks to Mr. Slug, so that he frequently falls to the ground, and thus it *appears* to kill him, but he very soon manages to divest himself of his sand-covered coat. In fact he naturally sheds this coat several times during his growth, and if the sand is applied at the proper time it proves a positive advantage to him, by stiffening his old and useless skin and thus enabling him the better to crawl out of it. If it be applied a day or two before the proper time to moult has come, then, like a good philosopher, determined to make the best of the circumstances, he concludes with some reluctance to let the soiled habit go before it is quite worn out. Common road-dust is equally harmless, and even plaster will prove ineffectual, unless applied before the last moult takes place; for after this moult the slug bids adieu to his slimy coat. *Moral:* Never use sand or road-dust for the Cherry Slug, but rely on lime, which will burn through the skin to the flesh; or on white hellebore water, which will poison.

APPENDIX TO JOINT-WORM ARTICLE PUBLISHED IN VOL. I. NO. 8.

The following Paper is the only one of a truly scientific nature which our deceased Associate left behind him. It was originally written as an appendix to the "Joint-worm" article published in No. 8 of our first volume, and is twice referred to (pp. 156 and 157) in that article; but, after preparing it, Mr. Walsh concluded that it was too bulky, and of a too purely scientific character, to interest the majority of our readers. He therefore concluded to more thoroughly elaborate it, and send it to Philadelphia for publication in the Transactions of the American Entomological Society. Accordingly he notified Mr. Cresson, Secretary of that Society, that he should send him such a paper for publication. About this time we were fortunate enough to breed, from the eggs of *Phylloptera oblongifolia*, DeGeer, both sexes of the curious little parasite, *Antigaster mirabilis*, n. sp., which is described at the close of this paper, and which Mr. Walsh had, till then, only known in the ♀ sex. On the 23rd of March, 1869, we transmitted to him specimens of both sexes, with such facts regarding them as we possessed, and upon receiving them he deferred sending the Paper to Philadelphia until he should find time to add these facts, with a description of ♂ *Antigaster*. But for a long time subsequently Mr. Walsh was too sick to do any but the most urgent and necessary work. When once his health had improved, and he had succeeded, in a measure, in attending to his accumulated correspondence, he wrote to Mr. Cresson, under date of October 15th, 1869, as follows: "I hope in about a week from now to send that article. There is about two days' work to do on it, and for the last two months I have been trying in vain to get two leisure days to myself." Suffice it to say that, from that time to the day of the fatal accident, he never found the needed leisure, and after his death the Paper was found unfinished. Aware of Mr. Walsh's intention, we immediately sent this paper to Mr. Cresson for publication in the Transactions, accompanied with such of our own correspondence with the deceased as related to the matter.

Upon being recently informed by Mr. Cresson that the amount of other MS. on hand was such that this Paper could not well be published there before next winter, and that there was a disposition to stop publishing for a few years so as to accumulate the income to increase the capital of the Society; we concluded to publish it in our own columns, and thus carry out the

original intention of the author, and render more complete the "Joint-worm" article already alluded to. This paper, from its importance, will commend itself to the scientific portion of our subscribers; and the generalizations contained in it will amply repay its perusal by the more general reader. We shall, as far as we are able, complete it, by adding a description of ♂ *Antigaster mirabilis*. EDITOR.

On the Group Eurytomides of the Hymenopterous Family Chalcididæ:

WITH REMARKS ON THE THEORY OF SPECIES, AND A DESCRIPTION OF ANTIGASTER, A NEW AND VERY ANOMALOUS GENUS OF CHALCIDIDÆ.

BY BENJ. D. WALSH, M.A.

FAMILY CHALCIDIDÆ.

Front Wings veined on the pattern shown in Figures 1, 2, 3, 4, 7 *and* 9.*

This very difficult and very extensive family has hitherto been almost entirely neglected by the entomologists of the United States. I have materials for the revision of all the different groups found in this country; but to complete such a work would require far more space than is here available. Consequently, I shall in this Paper confine myself chiefly to the discussion of one subordinate group, *Eurytomides*, first defining and limiting such genera of that group as I find in my collection, and secondly describing the species in my possession appertaining to those genera, with such brief notes on their natural history as I am able to furnish. Of the other two Chalcidian genera that I shall have occasion to refer to, one is well known to N. A Hymenopterists, and the other is a decidedly new and most anomalous and remarkable genus. In the latter case, I shall, of course, be compelled to publish a new generic name; in the former case, for lack of space to treat the subject as it ought to be treated, I shall simply adopt the established nomenclature.

It will be seen at once, from my notes on the habits of the various species of *Eurytomides*, which it will be necessary to describe, that many of these *Chalcis* flies are parasitic upon several different species, and that occasionally the very same *Chalcis* fly is parasitic upon species belonging to different Orders. (E. g. *Eurytoma studiosa*, Say, and *Decatoma subtilistigma*, n. sp.) In several cases Eurytomidous forms, that appear to belong to the same species, present certain more or less constant differences when they infest different species of insects. Such forms seem to deserve a distinctive name, which I have accordingly given to them, classifying them as mere varieties. Whether they be really varieties, or whether they be distinct species, depends—according to my views—upon the difficult and almost insoluble question, whether such so-called varieties attack indiscriminately the different insects upon which the so-called species to which they are referred is found to be parasitic, or whether each of them exclusively attacks the particular insect upon which it is itself found to be parasitic. In the former case I should classify them as varieties, in the latter case as species; for I have always considered the promiscuous interbreeding of two forms—whether actually ascertained or analogically inferred—as the true test of specific identity; and if such so-called varieties attack promiscuously the different insects upon which the whole so-called species is parasitic, the inference is that they derive that propensity, by the Laws of Inheritance, from interbreeding habitually with the other forms comprehended under the so-called species. If, on the other hand, such a so-called variety confines itself exclusively to that particular insect which it is actually found to infest, then I should infer that it can not interbreed habitually with the other forms referred to the same so-called species; because, if it did so, it would inevitably, by the Laws of Inheritance, acquire a propensity to attack all the different insects which are attacked by the other forms provisionally referred to the same species Consequently, upon this latter supposition, I should pronounce such a so-called variety to be in reality a distinct species.

It is a very interesting fact that a Hymenopterous parasite found in Europe (*Chrysis ignita*), which is exceedingly variable, both in size, in coloring, and in the structural peculiarities of the four terminal teeth of the abdomen—two of these teeth being in one variety (*Merope*) actually obsolete—is also exceedingly variable in the groups of insects upon which it is parasitic. Some, for example, attack the genus *Odynerus* (True Wasps), some the genus *Cerceris* (Digger Wasps), and some the genus *Vespa* (Social Wasps) Mr. Fred. Smith has suggested, that the variation in size of this *Chrysis* is perhaps due to the variation in size of the larvæ upon which it preys.* May not the structural and colorational variations, also, be due to similar causes, and may there not be distinct races—or, as I should call them, distinct species—of this insect, which prey exclusively or almost exclusively upon distinct groups of Wasps, and have transmitted such propensities by the laws of inheritance to their descendants? In that case, as well as in the hypothetical cases just now referred to among the *Chalcis* flies, we should have Entomophagic Varieties and Entomophagic Species, strictly analagous to what I have described as Phytophagic Varieties and Phytophagic Species. (*Proc. Ent. Soc. Phil.*, III., pp. 403-430; V., pp. 194-216.)

The club of the Chalcididous antenna appears to be normally composed of about three connate and often more or less confluent joints. European authors, in describing the number of joints in the Chalcididous antenna, seem to have always counted the typical joints of the club as true joints. This I have never done, 1st, because they really are not true *bona fide* joints, and, secondly, because in the same species some specimens look as if they had a two-jointed, some as if they had a three-jointed, and some almost as if they had a four-jointed club. But, to prevent confusion, after stating the number of verifiable free joints in the antenna—say, for instance, eight—I have always appended the formula "Scape +6+Club," or "Sc.+6+Cl."

As to certain very minute joints which certain European authors have described as existing in certain genera between the pedicel or second joint of the antenna, which is generally short, and the generally elongate third joint or first joint of the flagellum; I believe them not to be true horny joints at all, but mere wrinkles of the connecting membrane. Certainly, in the typical antenna, whether in Hymenoptera or in Coleoptera, the third joint is always a more or less elongate joint, and never a very minute one, as is so often the case with the pedicel or second joint †

SUBFAMILY EURYTOMIDES, Westw.

Collare very long and transverse-quadrate, as in Figure 8, *B, e; hind thighs not swelled.*

GENUS EURYTOMA. (Fig. 1, *a* ♀, *b* ♂.) Body partially contractile, as in *Chrysididæ*, with a deep, finely-sculptured groove for the reception of the middle femora, reaching from the base of the middle coxa to a point immediately beneath

* It is proper for me to acknowledge here that I have no acquaintance with Forster's Monograph of *Chalcididæ*, published in the German language in 1856, under the title of "Hymenopterologische Studien, Part II, Chalcididæ, Proctotrupii."

* For the facts respecting this *Chrysis*, see Mr. Smith's Paper in Stainton's *Entomologist's Annual* for 1862, pp. 89 and 87.

† I have throughout this Paper called the first or long joint of the antenna the "scape," and considered the "flagellum" as commencing with the third joint, calling the small second joint, whenever I have occasion to give it a distinctive name, the "pedicel." This agrees with Say's definition of these terms, except that he treats the prominence or "radicle," as it is technically termed, from which the antenna springs, as a distinct joint of the antenna. It appears also to agree with the terminology generally adopted by Coleopterists and Hymenopterists; at all events, I am informed by Baron Osten Sacken that the terms are defined as above by Schiodte so far as regards Coleoptera. But in Diptera, as I am informed on the same authority, the universal practice is to consider the first and second joints of the antenna as forming collectively the "scape," instead of calling the first joint alone the scape.

the insertion of the front wing. Antennæ ♂ ♀ usually as in Figure 1, *e* ♀, *f* ♂, 8-jointed or 9-jointed (Sc +6+Cl. or Sc. +7+Cl.), with a club composed of two or three connate and almost confluent joints. Head and thorax very coarsely punctate Abdomen as in Figure 1, *c* ♀, *d* ♂, 8-jointed, polished, and compressed, especially ♀; the peduncle or first joint sculptured, ♂ about as long as the rest of the abdomen, ♀ short; ♂ with the fourth joint, ♀ with the fifth joint very long and finely and closely punctate below. Stigma ♂ ♀ simple.

It is not very easy to see the sutures between the joints in the antenna of ♂ *Eurytoma;* but by examining a great number of ♂♂, where the antennæ were much convoluted, I ascertained that the crook or elbow was always *at the tip* and never *at the base* of any peduncle. Consequently, the real suture is at the tip of every peduncle, as shown in the figure.

Genus Decatoma. (Fig. 2, *a* ♀, *b* ♂.) Body contractile as in *Eurytoma* and with a similar groove for the middle femora. Antennæ ♂ ♀ as in Figure 2, *e* ♀, *f* ♂, ♂ 7-jointed (Sc.+5+Cl.), filiform, the club slightly compressed, ♀ 8-jointed (Sc.+6+Cl.), gradually clavate, the club considerably compressed. Head and thorax very coarsely punctate. Abdomen as in Figure 2, *c* ♀, *d* ♂, 8-jointed, polished, and compressed, especially ♀; peduncle sculptured, ♂ not quite as long as the rest of the abdomen, ♀ about half as long; ♂ with the fourth joint, ♀ with the fifth joint very long. Stigma ♂ ♀ thickened, widened and blackened.

Genus Isosoma. (Fig. 3, *b* ♀; fig. 4, *a* ♀, *b* ♂.) Body not contractile and with no groove to receive the middle femora. Antennæ ♂ ♀ as in Figure 4, *e* ♀, *f* ♂, 9-jointed (Sc.+7+Cl.), ♂ filiform and with joints 3-9 subequal in length, ♀ gradually clavate, joints 2 and 4-8 all equally short, 3 longer, 9 about as long as 7 and 8 put together. Head and thorax rather finely rugose. Abdomen as in Figure 4, *c* ♀, *d* ♂, 8-jointed, polished, cylindrical, ♂ with the peduncle short and sculptured, ♀ almost sessile; ♂ with joints 4 and 5 long, ♀ with joints 5 and 6 long. Stigma ♂ ♀ simple.

GENUS EURYTOMA.

Synoptical Table to find the species described below.

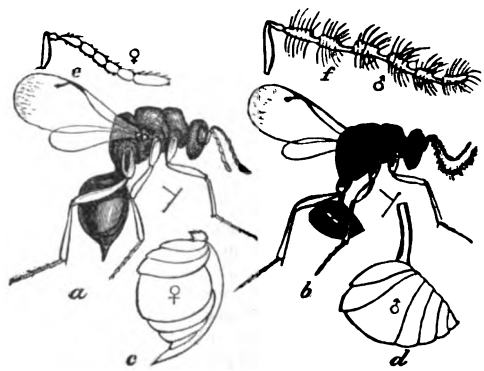
A. Antennæ female. 8-jointed (Sc.+6+Cl.)
- *a.* Head and thorax partly pale.....**bicolor, n. sp.**
- *b.* Head and thorax entirely black.
  - 1. Legs, including coxæ and trochanters, entirely or almost entirely pale.....
    - † Face male with white hairs; abdomen female banded with pale..... } **prunicola, n. sp.**
    - †† Face male with golden hairs; abdomen female all black..... } **auriceps, n. sp.**
  - 2. Legs, except the black coxæ, entirely pale.
    - † Antennæ female normal.....**punctiventris, n. sp.**
    - †† Antennæ female with joint 3 much longer than club..... } **abnormicornis, n. sp.**
  - 3. All 6 coxæ black, femora and tibiæ partly black, each successive pair more and more so.....
    - † Size large .....**diastrophi, n. sp.**
    - †† Size small.....**studiosa, Say.**

B. Antennæ female distinctly 9-jointed (Sc.+7+Cl.).....**gigantia, n. sp.**

Eurytoma bicolor, n sp.—♂♀ honey-yellow. *Head* subopaque, confluently and very coarsely punctate and with short whitish decumbent hairs; disk of occiput, and a spot enclosing the three ocelli and occasionally (1 ♂) extending in a salient angle nearly to the origin of the antennæ, but usually expanded in front so as only to leave a more or less wide pale orbit on each side, and usually more or less widely confluent behind with the occipital spot, all black. Antennæ ♂ ♀ 8-jointed, ♂ with no peduncle at the tip of joint 7 and joint 8 only ½ longer than 7, ♀ with joints 4-7 subequal in length; ♂ ♀ with the scape honey-yellow except at tip; joint 2 glabrous, shining and black, the remaining joints brown-black. *Thorax* sculptured as the head, but still more coarsely and with whitish pubescence Collare sometimes (1 ♂) with only a dorsal black triangle, usually black on its entire superior and partly on its lateral surface, the black part occasionally (1 ♀) enclosing on each side a pale dot. Mesothorax and metathorax above, except sometimes (1 ♂ 2 ♀) for a small space above the wings, black. *Abdomen* polished and glabrous, but a little hairy towards its tip; black ♂, ♀ black with the venter, and more or less of the lower part of the dorsum, honey-yellow Legs, including coxæ and trochanters, honey-yellow, sometimes (1 ♂ 1 ♀) immaculate, generally with the femora and tibiæ, especially ♀, more or less lightly tinged or vittate with dusky superiorly, each succeeding pair of legs more obviously so. *Wings* hyaline; veins brownish-white, usually towards their tip end ranging into brown-black Length ♂ 0.11, ♀ 0.08—0.11 inch.

Described from 1 ♂ 2 ♀ bred June 3d, from a rough, woody, subglobular, black fungoid swelling upon the twigs of Black Oak, which is infested by an undescribed Gall-fly, and which also occurs upon Red Oak, but in both cases always very sparingly and sparsely, and never in profusion and locally like the true Cynipidous gall, *Q. podagræ*, Walsh. This fungoid growth is the supposed gall referred to by Osten Sacken in *Proc. Ent. Soc. Phil.* IV, p. 365, note. A very similar but more elongate fungoid growth, which produces no Gall-fly whatever, but from which, as well as from the Oak-fungus, I have bred *Trochilium hoepes*, Walsh, occurs locally, but in the greatest profusion upon the Pig-nut Hickory (*Carya glabra*). From this Hickory-fungus, I have bred the following Beetles: 1st, the rare *Chramerus icoriæ*, Lec. (*Scolytidæ*); 2nd, a *Magdalinus*? resembling at first sight *M. barbitus*, Say, but structurally distinct, and 3d, a *Cis* which according to LeConte is most probably *C. pumicatus*, Mellie. I have no doubt that the Gall-fly obtained from the Oak-fungus is inquilinous, as well as the undistinguishable form bred by Mr. Bassett from galls on the stem of some plant supposed to be mustard. (See Osten Sacken, l. c.) Not improbably, the real gall-maker of these mustard-galls was some Gall-gnat (*Cecidomyia*). I shall have occasion on a subsequent page to quote several cases, where gall-flies belonging to notoriously inquilinous genera are inquilinous in Cecidomyidous galls. Authors have been sometimes a little too apt to jump to the conclusion that, because a particular insect is bred from a particular gall, therefore it is the author of that gall. No mode of reasoning can be more unsafe and unsound.

[Fig. 1.]



Eurytoma prunicola, n. sp. ♂ ♀ (Fig. 1) Black. *Head* subopaque, confluently and very coarsely punctate, and with short white decumbent hairs dense upon the face. Antennæ ♂ often distinctly 9-jointed with joint 9 rufous, and always with a peduncle at tip of joint 7 but none at tip of joint 8; in the same ♂ one antenna is 8-jointed and the other distinctly 9-jointed; antennæ ♀ always 8-jointed, with joints 4-7 subequal in length, and the club as long as 6 and 7 put together; ♂ ♀ with the scape except sometimes the extreme tip rufous, the other joints brown-black except sometimes the 9th joint ♂. *Thorax* sculptured as the head but still more coarsely, and with white pubescence. *Abdomen* polished and glabrous, but a little hairy towards its tip; ♂ immaculate, ♀ with the long medial or 5th joint always rufous and the 4th generally piceous. *Legs*, including coxæ and trochanters, honey-yellow or rufous; the tarsi and sometimes the tibiæ verging on white. *Wings* hyaline; veins brownish-white, generally shading into brown or even brown-black towards their tips. Length ♂ 0.11—0.13, ♀ 0.10—0.15 inch.

Described from 12 ♂ bred June 9th—19th, a single ♂ bred August 23d, and 31 ♀ bred June 9th—July 1st, all from the Cynipidous oak-gall *Q. prunus*, Walsh, of the preceding year's growth. I observe in this species of *Eurytoma*, as

well as in several others, a remarkable variation in the contour of the eye, which might readily be mistaken for a specific character. In most specimens ♂ ♀ the eyes are as smooth as they usually are in mature Hymenoptera; but in 3 ♂ 5 ♀ the surface of the eye is elevated in a number of large rounded whitish or gray tubercles—giving it a very singular appearance.

Variety **globulicola**. Two ♀ bred June 6th from the Cynipidous oak-gall *Q. globulus*, Fitch, of last year's growth, have the abdomen entirely rufous except some more or less extensive basal black stains, but do not otherwise differ.

Eurytoma auriceps, n. sp. ♂. Differs from the preceding ♂ only in the hairs of the head and body, being golden-yellow not white, so that the face has a bright golden instead of a white reflection; in the ♂ antennæ being always 8-jointed and never 9-jointed, joint 8 being long and composed apparently of two connate joints, the apical one sometimes rufous; and in the hind coxa being occasionally tinged with black externally. The ♀ differs from the preceding ♀ in the abdomen being black immaculate, and the hind coxæ and occasionally (2 ♀) a cloud on the anterior middle of the hind femur being black, or (1 ♀) in the entire middle of the hind femur being black. Generally, but not always, the middle and front coxæ are also more or less black. Length ♂ 0.10—0.13 inch, ♀ 0.10—0.14 inch.

Described from 8 ♂ 19 ♀ bred **Aug. 31st**—Sept. 30th from the Cynipidous **oak-gall** *Q. erinaceus*, Walsh (=*Q. pisum*, Fitch?) of the same year's growth, and 1 ♀ bred **May 6th** from the same gall of the preceding year's growth. A single normal ♂ was bred June 2d from the Cynipidous oak-gall *Q. spongifica*, O. S., and four normal ♀ from the Cynipidous oak-gall *Q. hirta*, Bassett, Aug. 30th—Sept. 7th. A single ♀, bred from the Cynipidous rose-gall *radicum*, O. S., is only abnormal by having the entire middle of the hind femur black, as in one typical ♀.

Variety **seminatrix**. Five ♂, bred July 2d from the Cynipidous oak-gall *seminator*, Harris, of the same year's growth, only differ from the normal ♂ in being on the average considerably smaller, and in one ♂ not only having the hind coxæ black, but also the external middle of the hind femur and tibia black, besides an abbreviated black line on the front and middle femora above. Twelve ♀, bred from the same gall July 2d—5th, differ from the normal ♀ in being on the average considerably smaller, and in the legs being more generally and more extensively marked with black, the front and middle femora being often more or less widely vittate with black above. As in the normal ♂, the ♂ has golden hair on the face. Length ♂ 0.08—0.10, ♀ 0.07—0.11 inch.

Eurytoma punctiventris, n. sp. ♀ Differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2d. The long or fifth abdominal joint is finely and closely punctured nearly up to the dorsal line. 3d. The peduncle and joints 2-5 of the abdomen are always black; but the remaining dorsal joints and the venter are occasionally rufo-piceous. 4th. All the six coxæ are black. Length ♀ 0 16—0.17 inch.

Described from 2 ♀, bred from the Cynipidous oak-gall *Q. mamma*, Walsh MS, and 1 ♀, bred July 26 most probably from the fungoid growth on oaks referred to above; ♂ unknown. Comes pretty near to *Eur. auriceps*, ♀ n. sp.; but is distinguishable by the larger size and the strongly punctured fifth joint of the abdomen.

Eurytoma abnormicornis, n. sp. ♀. Differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2nd. The scape of the antennæ is rufous tipped with black; joint 3 is 2½ times as long as wide; 4—7 gradually diminishing until 7 is square; and the club is only 1½ times as long as wide, much shorter than joint 3 or than joints 6 and 7 taken together, and also distinctly rufous. 3d. The abdomen is black immaculate, and as usual is only punctate on its lower surface. 4th. All the coxæ are black, and the hind femora and middle tibiæ clouded with dusky. Length ♀ 0.16 inch.

Described from 1 ♀ captured at large; ♂ unknown.

Eurytoma diastrophi, n. sp. ♂ ♀ Differ from *Eur. prunicola* only as follows: 1st. In the antennæ the scape, if rufous at all, is only basally so, and occasionally is black immaculate. 2d Antennæ ♂ are 8 jointed as in *auriceps*, but much shorter ♂ ♀ than either in *prunicola* or *auriceps*, and without any peduncle ♂ at tip of joint 7, as in ♂ of those two species. 3d. Abdomen ♀ is black immaculate 4th. In the legs the coxæ are all black, as also the hind femora and hind tibiæ, except at the base and tip; and the femora and tibiæ of the middle legs, and femora of the front legs, are often more or less marked with black externally. Length ♂ 0.11-0.12, ♀ 0.11—0.15 inch.

Described from 2 ♂ 19 ♀, bred **May 11th**—June 1st, from the Cynipidous bramble-gall of *Diastrophus nebulosus*, O. S. Six ♂ two ♀, bred May 24th—July 23d from the oak-fungus mentioned above, agree in every respect. I possess also 1 ♂ 9 ♀ captured at large.

Variety Bolteri, Riley. ♀ differs from *Eur. prunicola* ♀ only as follows: 1st. The size is larger. 2d. The antennal scape is black immaculate. 3d. The abdomen is black immaculate. 4th The hind legs are black except the knees and the tips of the tibiæ, which are honey-yellow; the four front legs are honey-yellow except the coxæ, trochanters, the base and outer middle of the femora, and a more or less abbreviated external vitta on the tibiæ; all the six tarsi verge upon white. Length ♀ 0 16—0.18 inch.

Described from 1 ♀ bred Aug. 27th, from the lepidopterous golden-rod gall of *Gelechia gallæsolidaginis*, Riley; another ♀ bred May 20th, its parentage unknown, and a third ♀ captured at large; ♂ unknown. Mr. Riley has described the ♂ in his *First Report* (p. 177), but almost all the characters that he gives are generic and not specific.

Eurytoma studiosa, Say. ♂ ♀ scarcely differ from the normal type of the preceding except in their much smaller size, in the antennæ being as long as in *Eur. prunicola*, and in the antennal scape being always black immaculate. Recognized from six ♂ six ♀, bred Sept. 7th—24th from the Cynipidous oak-gall *Q. ficus*, Fitch, of the same year's growth, and seven ♂ nine ♀, bred May 10th—June 5th, from the same gall of last year's growth.—Length ♂ 0 04—0.09, ♀ 0.05—0.11 inch.

The following, bred from galls of various kinds, do not differ materially either in size, structure or coloration from the above. 1st. From Cynipidous oak-galls; 1 ♂ 3 ♀, bred July 2—11, from *seminator*, Harris; 1 ♀, bred Sept. 18, from *Q. hirta*, Bassett; 1 ♂, from *Q. spongifica*, O. S.; and 2 ♂ 1 ♀, from the undescribed leaf-gall on Burr Oak, *Q. fragaria*, Walsh MS. 2nd. From tenthredinidous willow-galls; 3 ♂ 1 ♀, bred May 5—24, from *S. nodus*, Walsh; 4 ♂ 2 ♀ bred May 14—20 from *S. gemma*, Walsh; 1 ♂ 4 ♀ bred May 28—June 19, from *S. ovum*, Walsh; 4 ♂ 7 ♀ bred May 13—June, 8 from *S. ovulum*, Walsh; and 10 ♀ bred Aug. 13—Sept. 6, from *S. pomum*, Walsh. 3rd. From Cecidomyidous galls; 1 ♂ 1 ♀ bred Aug. 2—11, from the willow-gall *S. brassicoides*, Walsh, and 1 ♀ ascertained to be parasitic on *Cec. cornuta*, Walsh, which is inquilinous in that gall; 4 ♂ 2 ♀ bred May 19—22, from the willow-gall *strobiloides*, O. S ; 3 ♂ 7 ♀ bred May 21—June 9, from the willow-gall *S. batatas*, Walsh; 8 ♂ 10 ♀ from the goldenrod-gall *solidaginis*, O. S.; and 6 ♂ 2 ♀ from the same gall growing on ironweed. 4th. Two ♀ bred from the Aphidian leaf-gall *Caryæglobulus*, Walsh, growing on Shellbark Hickory 5th. From the undescribed Coccidous leaf-gall *Caryæ-fallax*, Walsh MS., growing on Shellbark Hickory, 7 ♂ 3 ♀ bred June 30. 6th. One ♂ bred from the black fungoid swelling on Pignut Hickory referred to above.

The following only differ from *Eur. studiosa*, Say, in having the base of the antennal scape more or less rufous, especially in ♀; 2 ♂ 4 ♀ bred Aug. 31—Sept. 9, from the oak-gall *Q. erinaceus*, Walsh, of the same year's growth, and 1 ♂ bred April 9 from the same gall of last year's growth; also 1 ♂ 1 ♀ bred from the oak-gall *Q palustris*, O. S., of the same year's growth.

I possess also 8 ♂ 33 ♀ captured at large, which should probably be referred to Say's species. I have been unable to identify *Eurytoma orbiculata*, Say, described in ♂ sex only, and the laws of coloration seem to me to forbid the existence of any species of *Eurytoma* with such legs as Say describes in this species. According to him, the legs are "honey-yellow, with the thighs, except at their origin and extremity, black." Now, 1st, If the thighs were much marked with black, the coxæ would necessarily also be more or less black, whereas they are by implication described as "honey-yellow;" 2nd, if the front femora were mostly black, as he describes them, the hind tibiæ would most probably be more or less black. For it is a very general law in *Chalcididæ*

that each successive pair of legs is more and more marked with black. In *Ephemeridæ*, on the contrary, the front pair of legs is normally by far the darkest, the four hind legs being nearly alike in their coloration. And so with other families of insects—each will be found to be marked according to certain general colorational laws. Why, if it be the correct doctrine that every species was independently created, the great Author of Nature should have restricted himself, in the case of each family, to certain definite colorational patterns, is a mystery which I have never yet been able to solve. Neither do those who still cling to this almost exploded doctrine make the least attempt to solve this insoluble enigma, but, in the words of Mr. Wallace, are content to "register the facts and wonder."

Eurytoma gigantea, n. sp. ♀ Black. *Head* subopaque, confluently and very coarsely punctate, and with short whitish decumbent hairs. Antennæ 9-jointed, the joints proportioned to each other as 14, 3, 6, 5, 5, 4, 4, 4, 6, the flagellar joints longer than usual in proportion to their breadth, the penultimate joint being 1½ times as long as wide. *Thorax* sculptured as the head, but still more coarsely. *Abdomen* polished and glabrous but a little hairy towards its tip, more compressed than usual, and with the usual fine punctation on the 5th or long joint extending almost up to the dorsal line. Ventral valve unusually long and acutely porrect. *Legs* black, the knees and the tips of the tibiæ, and in the front legs the entire tibiæ, all honey-yellow; tarsi, except their extreme tips, whitish, the anterior tarsi pale honey-yellow. *Wings* hyaline; veins honey-yellow. Length ♀ 0.19—0.25 inch.

Described from 2 ♀ captured at large; ♂ unknown. By far the largest species that I have seen, and readily distinguishable by the 9-jointed antennæ, the suture between the 8th and 9th joint being as distinctly a free suture as any of the others.

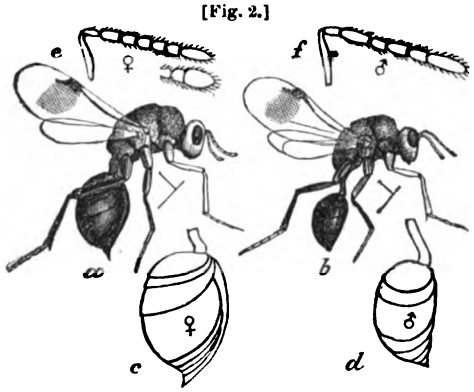
GENUS DECATOMA.

Synoptical table, to find the species described below.

A.—A distinct stigmatic dark band on the front wing.
- *a*. Body mostly black.
  - 1. Head mostly pale - - - - - - - - **varians**, n. sp.
  - 2. Head entirely black - - - - - - - - **nigriceps**, n. sp.
- *b* Body almost entirely pale - - - - - **nubilistigma**, n. sp.

B.—No stigmatic dark band.
- *a*. Body mostly black - - - - - - **hyalipennis**, n. sp.
- *b*. Body almost entirely pale - - - - **simplicistigma**, n sp.

[Fig. 2.]



Decatoma varians, n. sp.—♂♀ (Fig. 2) pale ochre-yellow ranging through honey-yellow to rufous. *Head* subopaque, confluently and very coarsely punctate. A black spot on the vertex, sometimes not extending beyond the ocelli, sometimes covering the whole vertex, and very rarely (1 ♀ spring brood, 1 ♀ autumnal brood) extending over the superior half of the occiput. Antennæ ranging from pale honey-yellow to rufous, the flagellum very rarely (1 ♀ spring brood, 1 ♀ autumnal brood) brown-black above. *Thorax* sculptured as the head, but still more coarsely, collare generally either immaculate or with only a basal black band, rarely with a subquadrate black patch covering the entire superior surface, and sometimes with only the lateral and basal limits of this patch black. Mesonotum and metanotum black, generally with the sutures and the entire postscutellar triangles of the mesonotum (Fig. 8, B, *d*) yellow or rufous. Pleura usually immaculate, rarely a little varied with black. *Abdomen* highly polished, with the peduncle ♂ nearly ⅔ as long, ♀ 1-5 as long as the rest of the abdomen; ♂ ♀ black with the peduncle, two or three of the basal joints and the venter often more or less piceous or rufous or honey-yellow; in one ♂ the entire abdomen, except a dorsal black patch behind, being honey-yellow. *Legs* rarely immaculate, usually with an abbreviated, narrow black superior vitta on the femur, which becomes wider and longer in each successive pair of legs, and occasionally in the hind femur covers the whole of it except the extreme base and tip; tibiæ the same, but the front tibiæ are almost always immaculate, and the hind tibiæ are generally black throughout except their extreme base and tip; coxæ and trochanters immaculate, but the hind coxæ are more or less widely vittate or bivittate with black above, except their extreme base and tip. *Wings* hyaline; stigma black, veins and stigmatic patch brown-black, the latter extending ⅔ of the way across the wing, and almost always widened behind so as to appear bottle-shaped, the stigma forming the neck of the bottle. Length ♂ 0.09—0 14, ♀ 0.10—0 16 inch.

Described from 26 ♂ 25 ♀, that came out from the Cynipidous oak-gall Q. *podagræ*, Walsh, of the same year's growth, September 4th—Oct. 11th, and 6 ♂ 2 ♀ that came out from the same gall, only of last year's growth, May 21st—June 21st. From the Cynipidous oak-gall Q. *spongifica*, O. S., I have obtained 1 ♂ 7 ♀, differing in no respect from those produced by the other gall (Q *podagræ*), except that they varied in size still more remarkably, the ♂ being only 0 07 inch and the largest ♀ as much as 0.16 inch long. From the allied oak-gall, Q. *inanis*, O. S, I bred a single ♂ of average size and coloration. A single rather small ♀, bred from the Cynipidous oak-gall, Q. *palustris*, O S., growing either on the Black or Laurel Oak, has the occiput black above and the antennæ brown-black above; but it is otherwise normally colored. I possess also 2 ♂ 1 ♀ captured at large, that do not differ from the normal form. This is an exceedingly variable species, both as regards size and coloration.

Variety **dubia**, ♂ ♀.—This form differs from *D. varians* only as follows: 1st. The average size is much larger. 2d. The coloration is darker, nearly the entire occiput, and the entire face except the antennal groove and the anterior border, the entire mesonotum including the postscutellar triangles, (*Fig.* 8, B, *d*), almost the entire pleura, and the entire abdomen, being black. 3d. The stigmatic dark band is never bottle-shaped, but is of the same width as the stigma throughout. Length ♂ 0.15, ♀ 0.16 inch.

Described from 1 ♂ 5 ♀, bred May 21st—29th, from the Cynipidous Oak-gall Q. *mamma*, Walsh MS., of the preceding year's growth. This gall, it should be observed, grows not only on a different species of Oak (Burr Oak) from those on which the galls producing *D varians* grow (Black, Red and Laurel Oaks), but also on a species belonging to a distinct subdivision of the genus. Out of a total of 32 ♂ 27 ♀ of *D. varians*, bred from the gall of Q. *podagræ*, but 3 ♀, measuring 0.10—0.15 inch, agree with the form *dubia*.

Decatoma nigriceps, n. sp.—♂ ♀ differ from the normal form of *D. varians* only as follows: 1st. The average size is much smaller, and the average color much darker. 2nd It is perceptibly a less elongate species ♂ ♀. 3rd. The head is entirely black, as indeed is almost the case with variety *dubia* of the preceding. 4th. The antennæ are always basally brown-black, though often dull rufous towards their tips, the scape being always brown-black, which is never the case in *varians*, even in the dark variety *dubia* 5th The entire thorax and abdomen are black, save that usually there is a more or less extensive honey-yellow or rufous spot on the side of the collare, which in one autumnal ♀ extends over its anterior half above, and save that in one vernal ♂ the suture at the tip of the abdominal peduncle is rufous, and in one autumnal ♀ the lower part of the abdomen is piceous. 6th The legs are on the average more heavily marked with black, and the coxæ are chiefly black. 7th. The dusky stigmatic patch is never widened behind the black stigma, is of a pale tint with its posterior boundary less definitely marked, and is occasionally reduced to a short dusky cloud, reaching only half way or even one-third of the way across the wing. Length ♂ 0.05—0.10, ♀ 0.07—0.10 inch.

Described from 3 ♂ 2 ♀, bred Sept. 22nd—24th, from the Cynipidous Oak-gall Q. *ficus*, Fitch, of the same year's growth, and 40 ♂ 16 ♀, bred May 8th—20th, from the same gall of the preceding year's growth. This species presents some remarkable analogies with the variety *dubia* of the preceding; and the gall Q. *ficus*, in which it is parasitic, grows on White Oak—a species belonging to the same group of Oaks as the Burr Oak, on which the gall that produces *dubia* occurs.

Variety **excrucians**, ♂ ♀. Three ♂ one ♀, bred July 2d from the Cynipidous gall *seminator*, Harris, which grows exclusively on White Oak, differ from the normal form of *nigriceps* only in the scape of the antennæ being dull rufous instead of brown-black. The antennal groove is black.

Decatoma hyalipennis, n. sp.—♂ black. *Head* subopaque, confluently and very coarsely punctate; orbits, narrowly interrupted above; the face below the antennæ, cheeks, and mouth, pale yellow. Antennæ dull yellow, joints 2 and 3 dusky above *Thorax* sculptured as the head, but still more coarsely. Collare pale yellow, except a wide dorsal vitta. Wing-scale and a longitudinal line above it, pale rufous. *Abdomen* highly polished, piceous below. Peduncle ⅔ as long as the rest of the abdomen. *Legs* pale yellow, basal ⅔ of the hind coxæ, and a patch above on the middle of the hind femora, black. *Wings* hyaline; veins brown; stigma black. No vestige whatever of any stigmatic cloud or patch. Length ♂ 0.08 inch.

The ♀ differs from the ♂ only as follows: 1st. The orbits are wider and not interrupted above, and the face and cheeks are yellow higher up. 2nd. The antennæ are dusky above to their tips. 3rd. The black vitta on the collare is narrower and sometimes abbreviated. 4th. The mesonotal sutures are more or less widely yellow, and the pleura and metathorax are stained with yellow. 5th. The abdominal peduncle is, as usual in the ♀ ♀ of this genus, considerably shorter, and the venter, and sometimes also the lower part of the abdominal dorsum, are honey-yellow. 6th. The legs are immaculate

Described from 1 ♂ 2♀, all three captured at large. Resembles the paler varieties of *varians*, but is sufficiently distinct by the total absence of any stigmatic dark patch. It may possibly be the case that the ♂ and ♀ here described belong to distinct species.

Decatoma simplicistigma, n. sp.—♂ ♀ pale ochre-yellow. *Head* subopaque, confluently and very coarsely punctate; disk of the occiput, ocelli, and sometimes a curved band connecting the ocelli and which is rarely (1 ♂ 1 ♀) confluent by a narrow tongue with the occipital spot, all black. Antennæ with the flagellum slightly obfuscate above, and joint 2 usually black above. *Thorax* sculptured as the head, but still more coarsely. Collare rarely (1 ♀) with a narrow dorsal black line; mesonotum with a more or less slender dorsal black triangle, the base of the triangle usually starting from the suture behind the collare, sometimes from the hind part of the collare, and the apex of the triangle approaching more or less nearly, but never quite attaining the scutel. Occasionally on each side of this black triangle two or three black dots are placed in the suture behind the collare. On the scutel a more or less wide dorsal black line not quite attaining its tip. Very rarely (1♀) the entire mesonotum is immaculate, mesothorax always with a more or less wide dorsal black line, which is almost always prolonged in a curve behind the mesothoracic scutel to the origin of the front wing. *Abdomen* highly polished, with the peduncle ♂ ♀ as in *varians*, the yellow color often merging more or less into rufous. Peduncle above and below, a dorsal line not attaining the tip, which generally expands upon each suture into a lateral tooth, and is sometimes dilated into one large dorsal patch, all black. *Legs* immaculate; but the suture at the origin of the hind coxæ is black. *Wings* hyaline; veins brown; stigma black; no vestige of any stigmatic cloud or patch. Length ♂ 0.06—0.11, ♀ 0.8—0.11 inch.

Described from 7 ♂ 14 ♀, bred Aug. 31st—Sept 30th, from the Cynipidous Oak-gall *Q. erinaceus*, Walsh (=*Q. pisum*, Fitch?) of the same year's growth, which occurs on White Oak. Two ♂, bred June 24th and July 8th, from the Cynipidous Oak-gall *Q. petiolicola*, Bassett, of the same year's growth, which occurs on Swamp White Oak, and one ♀ bred from the Oak-fig gall, which occurs on White Oak, differ in no respect from the described type.

Decatoma nubilistigma, n sp.—♂ ♀ differ from the preceding only as follows: 1st. The general color is ochre-yellow, ranging through honey-yellow to rufous. 2nd The ocellar black spot is never confluent with the occipital black spot. 3rd. The collare is always immaculate, and also (except 5 ♂ 4 ♀) the mesonotum, and (except 2 ♀) the scutel. 4th. The curved black line behind the scutel is usually expanded, in connection with the metathoracic black vitta, into a broad black triangle, the apex of which does not quite attain the abdominal peduncle. 5th. In the abdomen the peduncle is either immaculate or only vittate above with black. 6th. The femora and tibiæ have a linear abbreviated superior black vitta, scarcely perceptible in the front legs, and more obvious in each successive pair of legs. 7th. The front legs have a pale fuscous cloud, scarcely wider than the stigma is long, extending from the stigma from ⅓ to ⅘ of the way across the wing, or (1 ♀) only ¼ of the way. Length ♂ 0.08—0.10; ♀ 0.07—0.12 inch.

Described from 9 ♂ 29 ♀, bred May 7th—14th, from the Cecidomyidous Willow-gall *S batatas*, Walsh, of the preceding year's growth. Eleven ♂, bred June 2d, from an undescribed gall closely resembling *Q. tuber*, Fitch, but occurring not on White Oak but on Swamp White Oak, and in all probability Cynipidous, agree in every respect with the described types. I possess also a single normal ♀ captured at large.

[*To be continued.*]

A WORD FOR THE TOAD.

During the past week the Striped Potato-bug (*Lytta vittata*) came into my potato patch, and in two days defoliated about a thousand hills, when four of us set to work gathering them. In one hour we gathered a full gallon. Where did such a quantity of these bugs come from in so short a time? But the most curious part is to come. A black boy who was helping me said he did not like to gather the bugs, because wherever they were numerous he found a lot of toads, and he was afraid of toads. This attracted my attention, as I had seen a number of toads myself; and to my serprise I found that they were eating the bugs. One fellow ate twelve bugs, at the rate of four per minute. He would not eat any faster, although we ran the bugs all around and over him. Has any one else noticed this? It is certainly new to me, for I did not think anything would eat these Blister Beetles. The Ladybird is shy of them; and, so far as I have observed, none of the common cannibal beetles will attack them. S. F. T.

HANNIBAL, Mo., July, 1870.

INSECT DEPREDATIONS.—If I were to estimate the average loss per annum of the farmers of this country from insects at $100,000,000, I should doubtless be far below the mark. The loss of fruit alone by the devastations of insects, within a radius of fifty miles from this city, must amount in value to millions. In my neighborhood the peach once flourished, but flourishes no more, and cherries have been all but annihilated. Apples were till lately our most profitable and perhaps our most important product; but the worms take half our average crop and sadly damage what they do not utterly destroy. Plums we have ceased to grow or expect; our pears are generally stung and often blighted; even the currant has at last its fruit-destroying worm. We must fight our paltry adversaries more efficiently, or allow them to drive us wholly from the field.—*Horace Greeley.*

ERRATA.—Page 276, column 1, line 8 from bottom, for "*quinquemacalata*" read "*quinquemaculata*;" same page, column 2, line 16 from bottom, for "Shaffer" read "Saffer."

ENTOMOLOGICAL JOTTINGS.

[We propose to publish from time to time, under the above heading, such extracts from the letters of our correspondents as contain entomological facts worthy to be recorded, on account either of their scientific or of their practical importance. We hope our readers will contribute each their several mites towards the general fund; and in case they are not perfectly certain of the names of the insects, the peculiarities of which are to be mentioned, will send specimens along in order that each species may be duly identified.]

DO NOT DISSEMINATE INJURIOUS INSECTS—*Ridgewood, N. J.*—A few days ago I was asked to purchase some damaged grain for feeding out to stock; but, upon examining the same, I concluded that the best thing to be done with it was to burn or boil the same on the premises; and this course I advised without delay. It was all infested like the ear I send [with larvæ of Angoumois Grain Moth]. In the same room there were beans, all bored through by the Bean Weevil enclosed [*Bruchus obsoletus*, Say]. You can well imagine my surprise to find this insect in such large numbers; and it is surely time that entomologists sounded the tocsin, and waked up our agriculturists upon this insect question. I know that there are thousands of farmers in our country who will not pay two dollars a year for the ENTOMOLOGIST, just because they think it is economy not to do so, while at the same time they lose hundreds every year in consequence of their ignorance of what this periodical teaches. Not one farmer in a thousand would know this corn insect if it should come to him in purchased grain, consequently he would not hesitate to sow affected seed, and thereby bring ruin to himself and neighbors. I bid you God speed in your great work. If coaxing will not do, scold, fret and condemn, with an unsparing pen, those who will persistently ignore the value of entomology to our people. It is a pity, as well as a disgrace to our nation, that we have no money to aid science—which is only another word for prosperity—while there are millions to squander upon things, and even ideas, which will never benefit us as a people, nor bring happiness to one individual. A. S. FULLER.

A ROVE-BEETLE AS A PARASITE ON THE CABBAGE MAGGOT—*Boston, Mass., July* 18, '70.—Since I sent you the box containing larvæ, &c., I have bred a new parasite from part of the same lot; perhaps some of your pupæ produced *Staphylinadæ* instead of *Diptera*. I believe this fact new to science, at least it is so to us here. Early this spring my neighbor, Com. John Pope, called my attention to a fly larva destroying his young cabbage plants, just set out. I also found, on looking over my own, some that were wilted during the heat of the day, which proved, upon examination, to be caused by the same insect at work on the roots. I found from ten to thirty of different sizes on each infested plant. They destroy all the tender rootlets, and follow the centre of the main stock to the surface of the ground, finally killing the plant. This enemy, new to this particular location, I immediately took steps to become more familiar with. After transplanting some of my cabbages to my breeding cases, I left one strong, healthy stock, which I suspected of being infested, to remain in the ground until it was perfectly dead, when I opened the hill, June 20th, and took therefrom twenty-six pupæ, part of which I put into two boxes, one with moist earth the other dry. On opening them, July 12th, I found in each a perfect fly, which proved to answer exactly to the description given by Dr. Fitch, in the New York State Agricultural Report for 1866-7, of the Cabbage Fly (*Anthomyia brassicæ*, Bouché). On again examining my boxes, July 15th, I found a pretty little black Rove-beetle (*Staphylinus*), 0.15 inch long, and new to my collection. I then presumed it came from a pupa accidentally put in the box with the soil; but when I again opened my boxes, July 17th, what was my surprise to find in each three more of the same species of beetle. Upon further examination, I found six of the fly pupæ with a rough hole gnawed through the side, and as my boxes were perfectly tight, I had but one conclusion to come to. After a careful examination with the microscope of the remaining pupæ, I could detect no break in them, each segment or ring was entire. On examining the balance I found one live and one dead imago in one pupa, and the rest fly pupæ alive; thus proving beyond a doubt that either the eggs, or what seems more probable, the young larvæ of this *Staphylinus* entered the fly larvæ long before they had arrived at maturity. PHILIP S. SPRAGUE.

[It would be well for our correspondent to determine the species of *Staphylinus* which plays in this new role, and we shall be glad to hear further from him.—ED.]

OYSTER-SHELL BARK-LICE IN MISSISSIPPI; APPLE-TREE ROOT-LOUSE—*Carthage, Miss., July* 18, '70.—I am satisfied that we have the Oyster-shell Bark-louse in this neighborhood. I last winter cut down and burned about 200 apple trees which were infested with it. It was mostly on three or four large trees, from which it seemed to have spread to the others, which were small nursery trees. I kept a few of the limbs mostly infested, and thought that I should send them to you, but they have been mislaid in some way, so that I am unable to find them. There is no doubt, however, I think, but that it is the real Oyster-shell Bark-louse; it suits your description exactly. I examined under a great

many of the "shells" and found most of them empty. I found the white eggs under only one or two of the scales which I examined, the rest being apparently empty. I notice that, on page 213, Vol. II, in answer to B. P. Hanan, you say you can not repeat what you have already written, but refer him to an article in your first State Report. That is certainly very unsatisfactory to us down here, unless you have the Reports to send out gratuitously to all who may be interested in this matter. We take the ENTOMOLOGIST in order to get information on such subjects. I hope you will let us have an exhaustive article on the Oyster-shell Bark-louse.

The "Apple-root Plant-louse" does not kill most of the trees which it infests in this part of the country. They are very troublesome, and I should like to know some expeditious way to destroy them; but I think they seldom kill a tree outright. The apple trees in this country are mostly liberally supplied with them. I notice that you advise scalding them. That will do very well where the water is poured around the tree as it stands in the ground; but, by way of experiment, I tried dipping the roots of small trees in hot water—the water being nearly boiling hot—and the trees I "dipped" were all killed. J. W. MERCHANT.

[We shall defer our remarks on the Oyster-shell Bark-lice until we manage to get specimens from your locality, for at present we can only give opinions. We do not believe that the species can thrive, or even exist, in your latitude; and, from your remarks, incline to believe that your lice were imported and have died out. We have never heard of their injuries in Mississippi, and if they have ever proved injurious it will be easy enough to ascertain the fact. There are dozens of common and injurious insects of which we wish to give accounts, but, as everything cannot be published at once, we generally give priority to such subjects as are comparatively little understood, and which for the time interest the greatest number. It is not necessary to have the water in which to dip the apple trees too near the boiling point. A heat anywhere from 120° to 150° will suffice, and the roots must be immersed a different length of time according to the temperature. It may be used much hotter, however, when poured on the ground.—ED.]

NEST OF THE BALD-FACED HORNET—*Carthage, Miss.*—In your April number, in an article on the Bald-faced Hornet, by Henry Gilman, he says: "I once found in the woods, on the north side of Lake Michigan, a wasp nest nearly twice as large as a man's head. * * * This was the largest nest I ever saw." I have seen them here as large as an ordinary water bucket, and over a foot in diameter. J. W. M.

QUEEN HUMBLE-BEE—*LeRoy, N. Y., June* 1, 1870.—On May 24th I found this queen Humble-bee (which I now enclose you) in its nest, which was a deserted mouse nest. A mass of pollen found in this nest contained twelve eggs, which were placed in a circle, and upon their ends, around a small central ball of pollen. A single cell filled with honey was also found in this nest, and this cell had evidently just been completed when the queen was captured. I have always understood that no honey was collected until after the birth of the first brood—the cells thus emptied being then used as honey-cells. Of what species is this queen? it is marked 1; the other species, marked 2, is much less common here. J. CAMPBELL, JR.

[No. 1 is ♀ *Bombus pennsylvanicus*, DeGeer, and No. 2 is ♀ *B. ferviclus*, Fabr.—ED.]

ATTRACTION OF MALE MOTHS TO THE FEMALE—*Fairfield, Iowa, July* 22, '70.—Enclosed find a cocoon of *Attacus cecropia*. It was brought from Pennsylvania last fall. Ten days ago it gave forth a moth, which was placed under a common flour sieve. In a very short time *eleven* moths of the same kind were under the sieve. The gentleman insists that eleven were "hatched" from this one cocoon. I suggested that only one could possibly have come from it, and that the others had been attracted to it, as is often the case. But how did the moths get under the sieve? There is no possible way for this to be done; and the folks are satisfied that the eleven moths actually came from the one cocoon—another impossibility. Can you solve the matter? I went to the house, saw the cocoon and moths, and am satisfied the people would not wittingly practice a deception upon me.

J. M. SHAFFER.

[The attractive power of the female moths, and especially of those belonging to the same family (*Bombycidæ*) as the Mulberry Silk-worm, is very great, and the only solution that can be given of the above problem [?] is that the moth hatched from the cocoon was ♀, and that the ♂♂ were attracted to her, and managed to lift the sieve and get under it. It is well known that these ♀ moths will collect, or "semble" the ♂♂ from long distances, though whether by some peculiar odor or by some other power is not yet satisfactorily decided. If all the circumstances relating to the above occurrence were considered in detail, we should doubtless find nothing strange about it. Of course, no more than one moth issued from the cocoon.—ED.]

DEATH TO HOUSE FLIES—*Marshall, Mo., July* 18, '70.—Provide yourself with a fine-mesh insect net, similar to that in common use among entomologists, or what would be better, a net shaped like an entomologist's water net, and about a foot in diameter. Attach to this a handle long enough to reach the ceiling. Get ready a vessel of scalding water, a common wash-basin filled answering very well. About dusk, when the flies have gone to roost on the walls, commence. With a rapid motion move the net along, gathering in the flies till the body of them are unsettled. What you have in the net make sure of, by grasping it next the hoop with the hand. Shake the flies to bottom of net, and dip in the hot water; and when they are dead turn the net and shake them out. By this time the rest will be settled, when proceed as at first.

J. L. TOWNSEND.

A COINCIDENCE—*Baltimore, Md., August* 4, 1870.—On a hot summer's night in the country, a few years ago, I was reading Grote's description, and admiring the figure of his beautiful little *Philomma Henrietta* (Proc. Ent. Soc. Phil., Vol. III, p. 3, pl. II). I naturally desired to have a specimen of the insect; but as Grote indicated "Eastern States" as its habitat, I had no hope of securing one except by exchange or purchase. As I was thus reading and reflecting, lo! to my intense satisfaction—I will not say frantic delight—the identical species alighted *upon the very page* which I was reading; the only specimen I had ever observed before or have seen since! Was not this strange? I will not philosophise about it, but I consider it worth mentioning. Of course I took this stranger in and treated him accordingly. We, down here, do not reckon ours among the "Eastern States," and if our New York friend does not, he will have to give his little beauty a wider geographical range in his next edition. JNO. G. M.

SEVENTEEN-YEAR LOCUST TWO YEARS TOO LATE—*Baltimore, Md.*—1868 was our *Cicada septemdecim* year. Early in July of this year I found a solitary individual behind time, and *she* looked as if she had no business here. *She* was the most desolate, companionless, forsaken thing imaginable. Her family had all perished two years ago; and though she came forth in full maturity, and was clean looking enough, yet she had not a single beau—the most solitary maiden you ever saw! I took her in, and gave her a dose of diluted alcohol, but that did not revive her, but made her so drunk that she died in a surfeit. I thought possibly it might be *C. Cassinii*, but Uhler compared her with a number of specimens of the brood of 1868, and found her a true *seventeener;* she had much more red on the vent, and on the sides of the pronotum, than the *C. Cassinii*. What occasions the retardation in the development of some insects? It could not be climate or peculiarity of soil, or exposure to winds, or anything else I can think of, in the instance in question, for in 1868 the number proceeding from the very same spot was countless.

This reminds me of informing you that our Lancaster friend, Rathvon, was a little mistaken in presuming that this would be the year of the appearance of the Cicada in Kreutz Creek Valley, York county, Pa., as stated by him several months ago in your journal. I have made diligent inquiry of persons familiar with that district, and they report no locusts. Now, it may be that he gives that title to a district different from that which I know by that name (for I was born in that vicinity), but the Kreutz Creek Valley, 7 or 8 miles east of York, and bordering on the Susquehanna, was not visited this year by this singular Cicada. It is a pity, for thereby we lose one proof, at least, of their regular periodic appearance, and that is not pleasant; but I hope that Mr. R. will be able to explain it, so that the old theory may still be maintained. JNO. G. M.

FOOD-PLANT OF THE SOUTHERN CABBAGE BUTTERFLY—*Port Byron, Ills.*—In No. 3 of the present volume, you say that you do not know that the larva of *Pieris protodice* ever feeds on anything but Cabbage. Last summer I found one feeding on wild Pepper-grass, a plant of the same order as the Cabbage. I once found a chrysalis on a low hickory shrub, but that, of course, does not prove that it feeds on Hickory, else it also feeds on limestone, as the first chrysalis of the kind I ever saw was attached to a lime rock. And now I wish to thank you, and your most liberal publishers for the beautiful likeness of *Cecropia* in a late number. It seems to me perfect, and the most beautiful wood-cut I ever saw. MARION HOBART.

INSECTS AROUND INDIANAPOLIS—*June* 28, '70.—The Currant Worm (*Nematus ventricosus*) has made its first appearance this year with us in limited quantities. There has also appeared on the Alder, in our river bottoms, a similar larva, which has completely devoured the foliage of these bushes. The Colorado Potato-bug has begun its work, and bids fair to be very destructive. JNO. W. BYRKET.

COLORADO POTATO BEETLE IN INDIANA.—The Colorado Potato Beetle has so injured many of the potato fields in Clark county, in this State, that they have been plowed up. L. G. SAFFER.

REARING EGGS OF BUTTERFLIES.—I have been so successful this season in persuading female butterflies to deposit their eggs in captivity, that I think it well to mention the matter in the *Entomologist*. Last season I found it impossible to induce *P. marcellus* to lay upon leaves or stems of pawpaw that had been cut. This spring I placed a nail-keg, from which the bottom had been knocked out, the top being covered with cloth, over a low pawpaw growing near my house; and on confining a female *Ajax* therein, she at once began to deposit her eggs, and continued till the number reached more than twenty. In a few days the young larvæ came out, and with very little trouble I succeeded in raising several of them to the chrysalis state, in which they now are. (I expect to prove by this brood that *Marcellus* and *Ajax* are but different broods of the same insect; a fact I have felt confident of for some years past, but which I could not absolutely establish for want of the link which this experiment will supply.) I afterwards treated other females of *Ajax* in the same manner, and with the same results. A *C. philodice*, confined in the same way with growing clover, at once deposited a great number of eggs. So did *Nisioniades lycidas* and *N. pylades*, Scudd., upon *Hedysarum*. In fact, in every instance so far tried, the females have obliged me with as many eggs as I wanted; and I incline to think this mode of taking eggs will always be successful.—*W. H. Edwards, Coalburgh, West Va., in Canadian Entomologist.*

ON OUR TABLE.

NOTES ON GRAPTAS C. AUREUM AND INTERROGATIONIS, Fab. By Wm. H. Edwards.

THE COUNTRY GENTLEMAN'S MAGAZINE, for June, 1870. London (Eng.): Simpkin, Marshall & Co., publishers.

GEOLOGICAL SURVEY OF INDIANA for 1869. Also, Maps and Colored Sections, accompanying the same.

INJURIOUS INSECTS, NEW AND LITTLE KNOWN. A. S. Packard, Jr., M D. March, 1870.

GLIMPSES OF NATURE. A Magazine of Natural History in all its branches. Edited by Samuel M. Maxwell, Mauch Chunk, Pa.

THIRD ANNUAL REPORT OF THE OHIO STATE HORTICULTURAL SOCIETY, for 1869.

MONTHLY REPORTS OF THE DEPARTMENT OF AGRICULTURE FOR THE YEARS 1867-8. J. R. Dodge, editor. Washington, D. C.

NATIONAL EDUCATION: An Address delivered before the Illinois Wesleyan University, at Bloomington, Ills., June 14th, 1870, by Rev. A. C. George, D.D., Editor of the "Weekly Mail."

THE POULTRY BULLETIN. Issued monthly, by the Executive Committee of the New York State Poultry Society.

THE CANADIAN POULTRY CHRONICLE, No. 1. Toronto: July, 1870.

PREMIUM LIST OF ILLINOIS STATE FAIR. Commencing September 26th, 1870.

ENTOMOLOGY INDEED RUN MAD!—Our friend, Mark Miller, in the last number of the *Pomologist* has an article devoted to THE Currant-worm. The article treats ostensibly of the Currant or Gooseberry Span-worm (*Ellopia ribearia*, Fitch), which is a true moth (Order *Lepidoptera*) indigenous to America; but, by way of illustration, we are treated to the figures of a fly and sundry worms, which—though the first, in the venation of the wings, is unlike anything God ever made, and the last might be taken for so many young alligators—are yet evidently intended to represent the Imported Currant-worm (*Nematus ventricosus*, Klug), which is a Hymenopterous importation from Europe, and of which not one word is said in the text. Is it any wonder that Economic Entomology is under-estimated, or that it makes slow progress, when such loose trash will pass muster with our leading horticultural journals? What would our readers think, if we were to expatiate upon the excellencies of the Red Currant, and, by way of illustration, should refer them to a bunch of Concord Grapes? Verily we are driven almost to distraction when we find such ignorance foisted on the public for knowledge. Mark Twain's first teachings as an agricultural editor are gospel compared to the reckless and undigested stuff that is sometimes spread before the agricultural reader, under the cloak of that much abused word, "practical!"

RED SPIDER.—The *ad interim* committee of the Illinois State Horticultural Society report great damage done, in the northern part of the State, by a new [?] *Acarus*, or Mite. We presume they have got hold of that most troublesome pest, the Red Spider (*Trombidium telarium*, Herm.), which is pale yellow when young. The young of most mites differ much from the adults, and many of them are 6-legged instead of 8-legged, as they afterwards become. This mite is always injurious during hot, dry weather, and a good rain will soon diminish its numbers.

☞ We frequently refer our readers to back numbers of our Journal, in order to save time and repetition. We cannot continually repeat what has already been written about some particular insect, and those who have not been subscribers from the start, or have not the numbers to which reference is made, would do well to send to the publishers for them.

☞ We learn with pleasure that our Southern correspondent, J. P. Stelle, has been appointed Entomologist to the Tennessee State Horticultural Society.

ANSWERS TO CORRESPONDENTS.

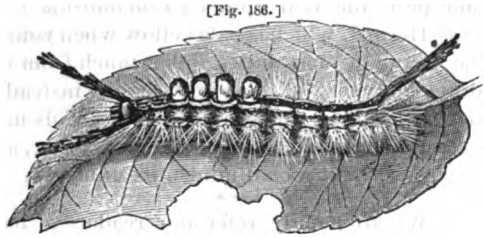
NOTICE.—Such of our correspondents as have already sent, or may hereafter send, small collections of insects to be named, will please to inform us if any of the species sent are from other States than their own. Lists of insects found in any particular locality are of especial interest, as throwing light upon the geographical distribution of species But to make them of real value, it is requisite that we know for certain whether or not all the insects in any particular list come from that particular locality, and if not, from what locality they do come.

We have lately received several small collections of insects to be named, and have, so far as our time would allow, answered by letter, because a long string of names is dry and uninteresting to the general reader. It requires much time to conscientiously name the many lots of insects that reach us, and hereafter we can take no notice of them, unless they are properly mounted on entomological pins, and the locality given in which they were found At least two specimens of each species should be sent when it is possible to do so, and each species should be separately numbered. When there are but few, we shall answer as heretofore in the columns of the ENTOMOLOGIST, but when there are many we shall answer by mail.

Insects Named—*J. K. Kidd, Linwood, Mo.*—The two flattish beetles with dark brown wing-covers, and a yellow thorax having a central dark spot, are carrion eaters. There are several species, of which this *Silpha peltata*, Catesby, is the largest in the genus. They are related to the Burying-beetles (*Necrophila*), and feed almost invariably upon dead animal matter, though occasionally on rotten vegetables. The brilliant green and copper-colored beetle, which had destroyed all the caterpillars in a nest on a crab-apple tree, is the Rummaging Ground-beetle (*Colosoma scrutator*, Fabr.), a very predacious and useful insect, which we illustrated last month (Fig. 168). The large Two-winged Fly which had killed the Bumble-bee, and which so much resembles its victim in coloration, is the Yellow-necked Laphria (*Laphria thoracica*, Fabr.) We have here a curious instance of mimicry between a predacious Two-winged Fly (Order *Diptera*) and a honey-producing Four-winged Fly (Order *Hymenoptera*), which, no doubt, enables the former, by deception, to catch its prey with ease. Though these large predacious flies usually attack a great variety of other insects, we have reason to believe that the species in question confines its attacks in a great measure to bees of the *Bombus* Family, in which the black and yellow are the prevailing colors.

Caterpillar of White-marked Tussock Moth—*G. C. B. Lawrence, Kans.*—The caterpillars from a young apple tree are those of the White-marked Tussock Moth (*Orgyia leucostigma*). We reproduce herewith (Fig. 186) an illustration taken from page 79 of our First Volume, where you will find some account of it. The male moth has curved pectinated antennæ, and a white spot on each front wing near the inner hind angle. It sits when in repose in the form of a delta, or rather of a heart of which the apex is at the head, and extends forwards its long, heavily clothed front feet to their full length. The female is wingless, like the same sex of the Canker-worm moth, and never leaves the cocoon from which she has emerged till her death, having previously deposited a great number of rounded white eggs, covered with a blanket of froth. In answer to your question, "will *Saperda bivittata* continue to exist if a tree dies during its stages of change?" it has been pretty satisfactorily proven that if it dies before it has arrived at the pupa stage, the insect perishes; but if the pupal condition is attained, it may develop into the beetle without hindrance. The Flat-headed Borer, however, continues to thrive on the dead wood for weeks after life has ceased in the tree.

[Fig. 186.]



Colors—Black, white, yellow and red.

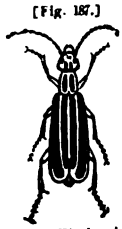
Does the Apple Curculio go underground to transform!—*Wm. Muir, Fox Creek, Mo.*—You wish to know whether the Apple Curculio ever attacks stone fruit, and whether its larva goes into the ground to transform, as stated by Dr. Hull. To the first question we reply emphatically "no," as we have never found it in stone fruit. To the second, we give it as our firm conviction that the larva never goes into the ground to transform. At all events, it never does when it infests the wild crab, as we have abundantly proved the present year; but in our own locality it is so scarce in tame apples that we have not yet been able to decide whether its habits when infesting the latter fruit are different, though we expect to do so before the end of the season, and have already taken proper steps towards deciding the point.

P. S.—Since the above was written we have heard from Mr. J. B. Miller, of Anna, Ills., to whom we sent for specimens of tame fruit that was infested, as we had learned that this insect was abundant in that vicinity. Upon cutting open the fruit, Mr. Miller found that it has the same habit of transforming within the tame fruit as we have found it to have in the wild crabs.

Walnut Caterpillars—*G. M. Levette, Indianapolis, Ind.*—The black worms with sparse white hairs, which have entirely stripped the Black Walnut trees around the State-house, though they have left untouched the other kinds, are the larvæ of the Hand-Maid Moth (*Datana ministra*, Drury). The habit which you noticed, of their descending and congregating in masses on the trunk of the tree, is characteristic of this and a few other species, and gives us a good opportunity to destroy them. There are two broods of this worm each year, the moths bred from the first worms appearing during July and depositing eggs which give birth to worms which go into the ground in the fall and hibernate in the pupa state.

Striped Blister Beetle—*Alex. Gault, Crescent Hill. Mo.*—The insects on your potato vines, and which you effectually killed by driving them into the fire, are the above-named beetle, of which we here reproduce a likeness (Fig. 187). It is not so abundant in Northern Illinois as in your present locality, and that is the reason you never noticed it there. The remedy you have applied will be found applicable to all the Blister-beetles that attack the Potato.

[Fig. 187.]



Colors—Black and yellow.

Parasite upon a Syrphus Larva—*B. D. Eastman, M.D., Washington, D. C.*—The little "capsule" which you found on a wild rose, is the puparium of a species of *Syrphus* fly; but in the present instance it had been stung when in the larva condition by a four-winged parasite, and the parasite having destroyed its host emerged in place of the true inhabitant. The subject of parasitism is extremely interesting, and opens a large field of study.

Grape-vine Fidia—*J. Hetzel, Bunker Hill, Ills.*—The chestnut-brown beetle on your grape-vines is the Grape-vine Fidia (*Fidia viticida*, Walsh, Fig. 188). It does much injury to the vines by riddling the leaves. Luckily this beetle has the same precautionary habit of dropping to the ground, upon the slightest disturbance, as has the Plum Curculio, and this habit enables us to keep it in check. The most efficient way of doing this is by the aid of chickens. The late Wm. Peschell, of Hermann, Mo., on whose vines this beetle had been exceedingly numerous, raised a large brood of chickens in 1867, and had them so well trained that all he had to do was to start them in the vineyard with a boy in front to shake the vines, and he himself behind the chicks. The chicks picked up every beetle which fell to the ground, and in this manner Mr. P. kept his vines so clean that he could scarcely find a single beetle in 1868.

[Fig. 188.]

Color—Chestnut-brown with a greyish pubescence.

Bee Nest—*J. R. Muhleman, Woodburn, Ills.*—The small bee spoken of on page 214, which we supposed might produce *Ceratina dupla*, Say, produced in reality *Prosopis affinis*, Smith. The species was kindly determined by Mr. E. T. Cresson, and you will find the original description in Mr. Smith's Catalogue of Hymenoptera in the British Museum, part I, page 24.

Some Interesting Insects—*A. S. Fuller, Ridgewood, N. J.*—You have our thanks for your numerous kindnesses. The following condensed answers should have been published last month: [1] The weevil in Lima beans, which you suppose to be the imported *Bruchus granarius*, are not that insect, but a native species (*Bruchus obsoletus*, Say) which we have several times referred to, and which is doing much damage to beans in various parts of the country. [2.] The ear of flint corn was infested by the larva of the Angoumois Grain Moth (*Butalis cerealella*,* Oliv.), of which you will find a full account in Harris, and in Fitch's Seventh Report. We have bred many moths from it. [3.] The large moth of a beautiful yellow color, sprinkled and marked with purple-brown, is the Imperial Dryocampa (*Dryocampa imperialis*, Drury). [4.] The brown worms which fold the leaves of the Hickory together by a tortuous silken case, were dead on arrival, and are new to us. We have bred from similar hickory cases a phytophagic variety of *Phycita nebulo*, Walsh. [5.] The smooth, narrow-cylindrical galls, 0.10—0.15 inch long, of a straw color, and inserted in a rough socket, which galls you find on the underside of hickory leaves, are the Tubular Hickory gall (*Cecidomyia tubicolæ*, O. S.), and are produced by a gall-gnat. [6.] The blackberry borer which arrived during our absence, and was dried up, was evidently the larva of the common species or Three-spotted Blackberry Borer (*Oberea tripunctata*, Fabr.) [7.] The worms which you think cause what is popularly termed "going blind" in the blossoms of the Blackberry, were dead and dry upon reaching us; but one solitary moth had issued from a pupa in the quill, and though damaged was readily recognized as the notorious Grapeberry Moth (*Lobesia botrana*) referred to on page 273 of our last number.

* Clemens referred this moth to the genus *Gelechia*. (Proc. Acad. Nat. Sci. Phil., 1860, p. 168.)

The Green Hag-Moth—*S. B. Shaw, Glendale, Mo.*—The pretty little moth with the abdomen and hind wings fulvous, and with the thorax and front wings delicate green, the latter bordered posteriorly with brown, and having a patch of the same color at base, one-third as long and one-half as wide as the wing itself, is *Callochlora viridis*, Reakirt. Its larva feeds on Cherry and Apple, and is of a bright scarlet color, with four dark blue-black lines along the back, and with prickly yellow horns or tubercles, which have the power of stinging. This moth was originally described by Mr. T. Reakirt by the name of *Limacodes viridus*, and subsequently as *Parasa viride*. Dr. A. S. Packard, Jr., afterwards described it as *Callochlora vernata*, erecting the genus for this species alone. Reakirt's specific name has the priority, and our little moth must consequently be known as *Callochlora viridis*. Synonyms enough for one insect, you will exclaim! Yes, but the synonyms are not the worst of it; for Mr. Reakirt has briefly described as the larva of our moth a worm which he found on Chestnut, and which has no relation to it, but must belong to some other species. We know this to be the case from ourselves having bred several specimens of the moth from the larva state.

The Antiopa Butterfly—*A. S. Moss, Fredonia, N. Y.*—The black prickly worms which have been congregating on your willows, are the larvæ of the above-named butterfly (*Vanessa antiopa*, Linn.), otherwise known, in England, as the "Camberwell Beauty." It is indeed a beautiful insect, with its rich purple-brown wings and their broad buff-yellow border. This insect is at times quite abundant, at others quite scarce; and the present year, according to accounts, it is quite common in the Eastern States, though rather scarce in the West.

Rose-gall and Pupa of Archippus Butterfly—*L. B. Custar, Logansport, Ind.*—The beautiful chrysalis (Fig. 189) found suspended to some oats, is that of the Archippus Butterfly. The small, round, yellowish galls on a rose leaf, covered with very short and blunt spines, instead of great prickles, as in that illustrated at Figure 192, are, we have every reason to believe, undescribed. Besides these two galls, we know of two other rose-leaf galls belonging to the same group, the one perfectly smooth, the other having something the form of a mangold-wurzel seed. All these galls agree in having thin shells, and containing a single larva; and they are doubtless all formed by gall-flies belonging to the genus *Rhodites*.

[Fig. 189.]

Colors—Green, black and gold.

White Grubs in Strawberry Beds—*J. B. Miller, Anna, Ills.*—The grubs in your strawberry beds, very much of the appearance of the common White Grub, but only half as large as that species when full grown, are, in all probability, the larvæ of the Immaculate Chafer (*Cycocephala immaculata*, Oliv.), a pale, yellow beetle, not quite one-half inch long, and having a dark head and two dusky points on the thorax. We have bred this species from similar grubs which occurred abundantly in a strawberry bed belonging to Mr. G. H. Baker, of your county.

Larva of the Thoas Swallow-tail—*E. H. Sprague.*—The worm which you send is rather rare in Missouri, and may be briefly described as of a mottled-brown color, and marked with pale grayish-white as follows: commencing in a band at sides of joint 1; running upwards and becoming less distinct to subdorsum of joint 4; occupying the back of joints 5, 6 and 7, reaching to proleg on joint 6, but only to subdorsum on 5 and 7, and occupying nearly the whole of joints 10, 11 and 12. This worm is the larva of the Thoas Swallow-tail (*Papilio thoas*, Linn.), our largest and most magnificent yellow and black butterfly. Its food-plant in the Southern States is the Orange tree; but you neither give your address nor (which we should like to know) the plant from which you took the worm.

Fungus on Wild Plums—*Subscriber, Pickens Station, Miss.*—The peculiar soft, yellow, pithy growth which we herewith illustrate, and which you find on a small Red Plum bush, is some kind of fungus. We find the same growth here during the month of June on the wild plum (*Prunus americana*). This fungus dries and blackens and remains on the tree through the winter. We shall leave its determination to fungologists, for the simple reason that we have no time to devote to this interesting part of Natural History.

[Fig. 190.]

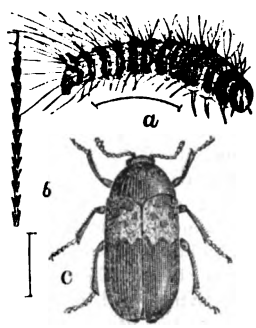
Color—Pale yellow when fresh, black when dry.

Larva of Clubbed Tortoise-beetle—*A. R. Bodley, Sturgis, Mich.*—The common Matrimony-vine is *Lycium vulgare*, and the Tortoise-beetles which you find upon it in company with their larvæ, are really the above-named species. The larvæ which you enclosed transformed on the way, and as we have never seen this larva, we should like other specimens. The Matrimony-vine belongs to the *Solanum* family, and your finding this insect upon it, furnishes additional proof that, while all other known Tortoise-beetles which have very flat larva (genera *Cassida, Coptocycla* and *Deloyala*) feed on plants belonging to the *Convolvulus* family, this species is exceptional, and feeds exclusively on such as belong to the *Solanum* family.

The Banded Ips in Calyx of Pear—*G. C. B.*—The small, shiny black beetle with two orange bands, interrupted along the back, on the wing-covers, is *Ips fasciatus*, Oliv. The fact of your finding them cutting their way into a pear, and eating into the calyx, is new and interesting. It is perfectly in accordance with the habits of the genus, however, for these beetles attack vegetable growths, though they most often confine their attacks to the funguses or to decaying vegetation.

The Larder-Beetle—*F. S. Sleeper, Galesburg, Mich.*—The brown hairy worms which have so ruined your collections of *Lepidoptera* are the larvæ of the Larder Beetle (*Dermestes lardarius*). It is a grievous pest to all sorts of preserved animals, and will soon ruin them when not well cared for. If you had constantly watched your collection, and examined the butterflies whenever you noticed any powdery excrement at the bottom of your boxes, you would never have lost a specimen. That our readers may recognize this destructive beetle, we present at Figure 191 enlarged drawings of its larva (*a*), one of the larval hairs, showing its peculiar formation (*b*), and the beetle (*c*).

[Fig. 191.]



Colors—(a) brown; (c) dark-brown and pale yellowish-brown.

Moth named—*E. M. Hale, Chicago, Ills.*—The pretty blackish moth, with the head above, prothorax beneath and tegulæ in front orange, and with the thorax and abdomen dark metallic-blue, is *Ctenucha latreillana*, Kirby, an insect which has been unusually common the present year in this vicinity.

The Little Cicada—*G. O. Hardeman, Summit, Mo.*—The small *Cicada* collected by you some time ago on the prairie, is a variety of *C. parvula*, Say, as kindly determined by Mr. Uhler, of Baltimore. It differs slightly from Say's description, and we were a little puzzled with it. It is widely distributed, and occurs more especially on the low grounds.

The Brown Mantispian—*G. C. B.*—Your insect, which "plays so curiously with his hands," and looks not unlike a miniature Camel-cricket, is the *Mantispa brunnea* of Say. It is one of our most common species, and being predaceous, is, of course, beneficial. The green Tiger-beetle is *Tetracha virginica*. (A. E., I. Fig. 45.)

Golden Tortoise-beetle on Gooseberry—*W. T. Bell, Franklin, Pa.*—The pretty golden beetle which you found on a gooseberry leaf, is the above-named insect (*Cassida aurichalcea*, Fabr., A. E., 1, Fig. 178, *a*). It doubtless wandered on to the gooseberry leaf from some other plant belonging to the *Convolvulus* family.

Small Reddish Snout-beetle on Apple—*Jas. Weed, Muscatine, Iowa.*—The small reddish or rufous snout-beetle, only 0.10 inch long, and distinguished principally by a line of white hairs, more or less conspicuous, extending from the white scutel to the head, is the Thorn Anthonomus (*A. crataegi*, Walsh*), a species which breeds in many different galls made by either Plant-lice, Saw-flies, or Gall-gnats. From the fact that you found it with its snout fully imbedded in an apple, it perhaps breeds in this fruit also. It is not a small Four-humped curculio. No insects change or grow after once arriving at the perfect or imago state.

* P. E. S. P., VI, p. 266.

Spotted Pelidnota; Error regarding it—*J. D. Gros, Darien Centre, N. Y.*—Your beetle is the Spotted Pelidnota, of which you will find a full account in the present number. The little bronze-colored ciliated eggs are those of a true bug (*Heteroptera*), and you are entirely mistaken in supposing them to be the eggs of this beetle. No beetle is ever hatched from the egg a perfect beetle, any more than a bird is hatched perfect and full fledged from its egg.

Prickly Rose Gall—*Subscriber, Pickens Sta., Miss.*—The pretty little prickly galls which you found on a wild rose, and which we illustrate herewith (Fig. 192), may be appropriately known in popular language as the Prickly Rose-gall. It is made by a rather large gall-fly (*Rhodites bicolor*, Harr.) which has a black and rough-punctured head and thorax, and a smooth, highly polished, brownish-red body. The color of the gall varies with its age; the young gall often being of a beautiful rose-color, and reminding one of a strawberry, the mature gall being more generally green, and the old last year's galls being dull silvery-gray.

[Fig. 192.]

Color—Either green or rose-color.

Questions answered—*K. Parsons, Cambridge, Mass.*—The small case found on your sister's dress was, so far as we could make out, that of some clothes moth. The Clothes moths, and many of those moths which live upon vegetable substances, construct a tubular dwelling of the material on which they feed, and drag it about with them during the larva stage; in most cases it serves also as a cocoon for the final transformations. Only one larva inhabits each case. The cocoons attached to the skin of the caterpillar you send are those of a parasitic *Microgaster*. The insects on the hawthorn twig are the common Oyster-shell Bark-louse. The young, when first hatched from the egg, are minute whitish, oval, six-footed creatures, very active, and scarcely visible without the aid of a microscope. As they remain active but a few days before fixing themselves to the bark, they should be attacked as soon as hatched. Ants frequently vary their diet with soft and helpless or disabled insects.

Hog-caterpillar of the Vine infested with Parasites—*J. M. Wilson, Sterling, Ills.*—Your Grape-vine worm is the above-named species (*Chœrocampa pampinatrix*), and the little white cocoons are those of the same little *Microgaster* referred to and illustrated at Figure 15 of this volume.

Larva of Abbot Sphinx—*S. E. Todd, New York.*—The worm which you found on your grapevines, and which measured nearly four and a half inches in length, is the larva of the Abbot Sphinx (*Thyreus Abbotii*, A. E., II, Fig. 84). The catch-'em-and-kill-'em remedy is the best you can adopt in this instance.

Cecropia Worm—*E. G. Hofman, St. Louis, Mo.*—Your worm on Plum is the Cecropia worm (Fig. 62 of this volume).

Flat-headed Borer in Soft Maples—*L. R. Elliott, Manhattan, Kans.*—The hammer-headed borers which you send, and which had killed a fine Soft Maple tree, are the Flat-headed Apple-tree Borer (*Chrysobothris femorata*, Fabr.) This insect is greatly damaging the Soft Maples in many of our Western towns, and unless precautions are taken to prevent such a catastrophe, this fine tree will soon be as badly injured all over the country as the Black Locust has been by its borer (*Arhopalus robiniæ*). We wish we could whisper into the ear of every man who plants a Soft Maple, that unless he thoroughly soaps the trunk and larger branches once or twice every summer, his tree will not last probably more than half a dozen years. We notice this beautiful shade tree dying wherever we go, when a little knowledge of these "contemptible bugs" would have enabled their owners to save them. Two applications of soap during the year—the one as early as the beginning of May, the other any time during summer—will protect the trees from its attacks. Be careful also not to bruise or injure the bark in any way.

Cherry Plant-lice and their Foes—*C. H. Roberts, Poughkeepsie, N. Y.*—The Plant-lice on the cherry trees are the above-named species (*Aphis cerasi*, Linn.) The maggots "of beautiful colors" which feed with such gluttony on these lice are the larvæ of some Syrphus-fly; and the darker, more active larva, is that of the Convergent Lady-bird (*Hippodamia convergens*, Gu.), which we illustrate herewith (Fig. 193), *a* showing the larva, *b* the pupa, and *c* the beetle. Both these last insects are very useful in destroying the plant-lice, and both pass through their transformations on or near the place where the larva is found. The *Syrphus* pupa is attached by the whole length of the under surface, while that of the lady-bird hangs by the tail from the bark or leaf of the tree.

[Fig. 193.]

a *b* *c*

Colors—(*a*) blue, orange and black; (*b*) venetian-red and black; (*c*) orange-red, black and white.

Grape-vine Flea-beetle—The steel-blue beetle which has done so much damage to your vines is the above-named insect (*Haltica chalybea*, Ill.) The brown "slugs" or "worms" accompanying them are the young of the same. It is probably the Grape-vine Saw-fly (*Selandria vitis*, Harris) in the larva state, that you allude to as having a tadpole form. Harris recommends lime dusted on the leaves; also a wash of one pound of hard soap to five gallons water—*i. e.*, strong soapsuds.

Blood Sucker and Pear Slug—*Geo. A. Watson, Maysville, Ky.*—The black bug, of which you once found a specimen, gorged with your own blood, under a mattress, was too much mutilated to be recognizable, though we can tell you with certainty that it belongs to the great *Reduvius* family. The fragments seem to belong to the Black Corsair (*Pirates picipes*, H. Sch.), the beak of which we know to be very sharp and poisonous. All bugs are suckers either of the juices of plants or of the fluids of animals, and many species vary their diet at will. Instances are frequent of bugs, whose ordinary food is of a vegetable character, piercing and sucking the blood of human beings.

The Pear slug (*Selandria cerasi*, Peck) is easily destroyed by dusting the trees with lime. Coal oil will injure the tree. Strong soapsuds will be useful, but slacked lime is better.

Botanical Department.

Dr. GEORGE VASEY, Editor, Richview, Ills.

FOXGLOVE PENTSTEMON.

(*Pentstemon Digitalis*, Nutt.)

The genus *Pentstemon* is, in North America, an extensive one, comprising, according to Dr. Gray's Synopsis of this genus (Proc. Am. Acad. Arts and Sciences, Phila., 1862), over sixty species; vastly the larger portion of which are inhabitants of the country west of the Mississippi river.

One species only (*Pentstemon pubescens*) extends over all the region east of the Mississippi; one species (*Pentstemon dissectus*, Ell.) characterized by pinnately-parted leaves, occurs only in the Southern States from Georgia to Florida; one species (*Pentstemon grandiflorus*, Nutt.), though most abundant west of the Mississippi, reaches over sparingly into Wisconsin and Illinois; and one other species (*P. Digitalis*, Nutt.) the subject of our present sketch, extends from Illinois to Arkansas, Louisiana and Georgia. The remaining species are variously distributed through California, New Mexico and the Rocky Mountain region.

[Fig. 194.]

Foxglove Pentstemon (*Pentstemon Digitalis*, Nutt.)

This is one of our handsomest native ornamental plants, growing, in favorable localities, three to four feet high. The stem is smooth, unbranched below, with four or five pairs of large leaves at intervals of five or six inches, the upper half forming a panicle of flowers, by the development of a pair of branches from each of the upper pairs of leaves, the leaves becoming smaller and the spaces shorter to the top. The flower stalks, or branches, are a little longer than the leaves, terminated by the clusters of flowers.

The engraving represents their form and appearance, a little less than the natural size. The plant belongs to the Natural Order *Scrophulariaceæ*, to which also belongs the European Foxglove (*Digitalis*), from a resemblance to which our plant has received its specific name. The flowers are a little less than an inch long, white, with a few faint lines of light purple. The leaves are ovate-lanceolate, finely toothed, from three to six inches long, and clasping the stem. The plant is perennial and showy, and would make a good appearance in the garden.

A NEW AND PECULIAR FORM OF HEUCHERA.

We promised, in the July number, to give, this month, an account of a peculiar species or form of Alum-root (*Heuchera*) from Southern Illinois. We sent a specimen of this plant to Dr. Gray, who considers it a form or variety of *Heuchera villosa*, Michx. He says that Buckley years ago gave it a name, and that it was also distributed years ago in Rugel's sets of plants, and distinguished and named by Shuttleworth as *Heuchera Rugellii*. The specimens as they came to us present very great differences from *H. villosa*. We hope it may be attentively watched by botanists in whose region it may be likely to occur—for instance in Kentucky and Tennessee. We give below a description of its prominent characters:

Heuchera villosa, Michx. (?) variety; *H. Rugellii*, Shuttleworth.—Scapes slender, somewhat declining, 6 to 10 inches long, about equaling the leaves; raceme loose, oblong, 3 to 4 inches long of 6 to 8 branches; peduncles almost filiform, each with 3 to 6 small flowers; upper bracts very small, laciniate; petals oblong-spatulate, tapering into a long claw; calyx somewhat turbinate; sepals obtuse; stamens about equaling the petals; beaks of the pods recurved at maturity; leaves reniform, about 3 inches long by 4 wide, with about 5 principal rounded lobes, teeth coarse, rounded, with an abrupt point; petioles villous, with glandular whitish hairs; leaf thin, roughish, with scattered hairs. Shaded Cliffs, Makanda, Ill., July. —*S. A. Forbes.*

COTTONWOOD—WHICH IS IT.

Populus monilifera or *Populus angulata?*

Dr. J. G. Cooper, in his Report, in Vol. XII of the Pacific Railroad Survey in Oregon, says:

"Two, and perhaps more, species of Poplar form the forest growth on the inundated river banks, from an elevation of 5000 feet down to tide-water. They are also found on all the rivers running from the Rocky Mountains, and perhaps entirely across the continent. One of these is the Cottonwood (*Populus monilifera*); the other is distinguished as 'Balsam,' or 'Bitter Poplar,' it is peculiar to the western half of the continent (*Populus angustifolia*). The wood of both is of little value, but they grow rapidly and are ornamental. The islands and low shores of the Columbia are covered with these trees, of larger size than I have ever seen them elsewhere."

Dr. J. M. Bigelow, in Vol. XIV of the Reports, says:

"POPULUS MONILIFERA—COTTONWOOD—POPLAR.—This tree is somewhat different from the Cottonwood of the Mississippi, which I believe is *P. angulata*. It is found east as far as the Canadian river, and West until we cross the Sierra Nevada. In the Rio Grand valley it is used by the Mexicans for building. It is also employed for farming utensils, the most unique of which is their cart, the wheels being made of a section of this tree. They are six or eight inches thick, and manufactured in the rudest manner. The timber is tough and hard. It does not grow here as tall as on the Mississippi river, but occasionally it is quite large and spreading."

Dr. John Torrey, in his report on the plants of California and New Mexico, collected in the expedition commanded by Captain Williamson (Report, Vol. IX), says:

"*Populus monilifera*, Ait.—This is the common Cottonwood, which has a range from the Atlantic to the great Colorado, and almost as great an extent of latitude. It is abundant in some places near Fort Yuma."

Dr. James, in Long's Expedition to the Rocky Mountains, says:

"As far as our observation has extended, the Poplar most common in the country of the Mississippi, and indeed almost the only one which occurs, is the *Populus angulata*. This tree is perhaps as widely distributed as any indigenous to North America, extending at least from Canada to Louisiana, and from the Atlantic to the lower part of the Columbia river."

A QUESTION.—The northern limits of southern plants and the southern limits of northern plants should be carefully noted. There are three northern plants found as far south as Peoria, viz., *Arctostaphylos uva-ursi*, Spring., *Menyanthes trifoliata*, Linn., and *Salix myrtilloides*, L. (*S. pedicellaris*, Pursh.) Where are the southern limits of these plants in Illinois? F. BRENDEL.

OUR NATIVE OAKS.—No. 3.

[Fig. 195.]

Willow Oak (*Quercus Phillos*, L.)

We would say with respect to the figures given of the Oaks, that we have only aimed to present correct average outlines, as an aid, through the eye, to a clearer conception of the differences between the species. As to nervation, surface of leaf, &c., we have not attempted precision. The form of leaf in different species varies so much that our space forbids a full illustration.

We propose in this paper to notice some of the biennial fruited Oaks. First, in that division we have the entire or willow-leaved species. In the eastern portion of the United States there are of this section three species. 1. The upland Willow Oak (*Quercus cinerea*, Michx.) This is a shrub or small tree, ranging from five to twenty feet high, growing in sandy pine barrens from Eastern Virginia through the Southern States, becoming very abundant in Mississippi. The leaves are from 1½ to 2 inches long, thick, shining, oblong, on young shoots sometimes toothed, and hanging long on the tree, but not evergreen except far south. They are bristle-pointed, downy on the under surface, with the edge or margin somewhat rolled back. The acorn is roundish, about half an inch long, the cup shallow and very short stalked.

2. The Willow Oak (*Quercus phillos*, L.) This is a large tree growing in low swampy

ground from New Jersey to Florida and westward, being probably most abundant in North and South Carolina. It varies in height from 30 to 60 feet, with a straight trunk, and a smooth thick bark. The leaves, as the name indicates, resemble those of the willow, being narrowly lanceolate, three to four inches long, very smooth and deciduous. The acorns are small and roundish. The timber is coarse grained, and of little value.

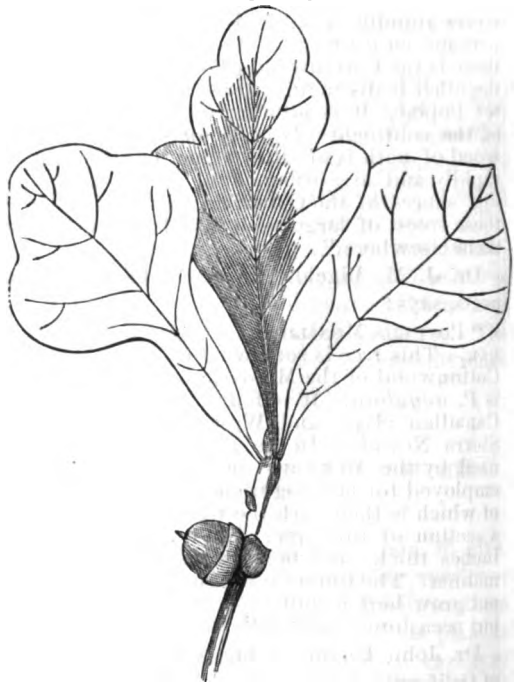
[Fig. 196.]

Laurel or Shingle Oak (*Quercus imbricaria*, Michx.)

3. The Shingle Oak (*Quercus imbricaria*, Mx.) This is a tree of moderate size, with a roundish dense head, smoothish black bark, leaves four to five inches long, thick and shining, oblong or lance oblong, acute pointed, with a very short petiole, sometimes slightly wavy on the margin, but not toothed, and the under surface downy when young. The acorn is roundish, small, half an inch long, the cup shallow and enclosing about one-fourth of the acorn. This tree is quite common in some parts of the Western States, becoming more abundant farther south, and reaching west to the headwaters of the Arkansas river. Its wood is of little value, making even poor shingles. It is known in different localities by different names, as Laurel Oak, Pin Oak, Black Jack, and Shingle Oak.

A form or variety of Oak which has been considered a hybrid, has been known in a few localities for many years as *Quercus Leana*. A description of this tree, by Dr. F. Brendel, in whose vicinity it grows, will be found at the close of this article.

[Fig. 197.]



Water Oak (*Quercus aquatica*, Catesby).

4. The Water Oak (*Quercus aquatica*, Catesby.) This tree is a native of the Southern States. It grows from 40 to 60 feet high, the wood is tough, the bark smooth, or in the old trees slightly furrowed. The leaves are very peculiar in form, being somewhat wedge-shaped, or rather with a long and narrow wedge-shaped base, expanded at the top into a somewhat three-lobed, obovate summit. They are smooth and shining, about three inches long, and the summit one to one and a half inches broad. The acorn is about half an inch long, cup shallow, half an inch broad.

5. Black Jack, or Jack Oak (*Q. nigra*, Linn., Willd.) A small sized tree from 15 to 25 or 30 feet high, with thick, rough, black bark, growing mostly in thin, poor soil, usually forming a dense roundish head. The leaves are thick and leathery in texture, five or six inches long, expanding at the top into about three broad, bristle-pointed lobes, gradually narrowed below, and ending in a rounded base, with very short petiole—they are covered with a rusty down on the under surface, as is also the young twigs—the upper surface is shining and veiny.

The leaves are liable to much variation in size and shape, in some cases the lobes being only marked by gentle undulations, in others by sharp and deep notches. The acorn is short and ovoid, and nearly half covered by the rough-scaled cup.

[Fig. 108.]

Black Jack (*Quercus nigra*, L.)

A LIST OF PLANTS

GROWING IN THE VICINITY OF CHICAGO DURING MARCH, APRIL AND MAY.

BY H. A. WARNE.

The district around Chicago might seem to one not personally acquainted with the country as a poor one for botanical collection, consisting mainly, as it does, of flat prairie; but our city botanists familiar with the region, have found it quite fruitful in species.

Taking the city as a centre, within the area of a circle swept by a radius of thirty miles, I am inclined to think a greater variety of plants may be collected than within the same space in any other portion of this State. In the barren sandy soil along Lake Michigan we find plants suggestive of the sea shore, including a number of species limited elsewhere to the Atlantic coast, or the neighborhood of saline deposits in the interior. Passing to the prairie within five or six miles of the city, along the lines of several railroads, where a strip of land has been rescued from tillage and protected from cattle, we may still find the distinctive plants of the prairie in rich profusion. This is peculiarly true of Graceland and Hyde Park suburbs.

For the species belonging to the woods and the moist river region we have our choice of following up the north branch of Chicago river, or at a somewhat greater distance, the course of the Des Plaines. A day's trip to Glencoe takes us to deep ravines with their appropriate plants; while an excursion to Lake Calumet, or the adjoining county of Lake, brings us to a local flora of much interest; in the latter case the plants are associated with evergreens.

Within such an area we might reasonably expect to find a varied vegetation. Our season here opens rather late compared with other sections, but advances with rapid strides after the middle of April.

My list for March includes only that odd plant the Skunk Cabbage (*Symplocarpus fœtidus*), whose variegated spathes, just thrust above ground, suggest at once the tulip and some fleshy fungus. This abounds in swampy localities north of the city, and along the Des Plaines river. It is our first spring flower, but to my surprise last fall, just as the Gentians were putting in an appearance, I found a solitary purple and green spathe of this plant. What abnormal condition caused this unusual blossoming I am unable to decide. It is paralleled in my own observation, however, by the appearance in autumn of the flowers of *Viola pedata*. In such plants the flower buds are so far advanced at the close of autumn as to yield to the first touches of spring, so that but little stimulus of a certain character starts them into bloom. Autumnal impulses may thus occasionally anticipate those of spring. The Hepatica and May flower (*Epigea*) may doubtless be found in bloom under similar circumstances with any of the stemless violets. April ushered in the Prickly Ash (*Zanthoxylum Americana*), its yellowish-green flowers clustered on the bare and prickly twigs, in the river district; while along the lake shore the low shrubs of the aromatic Sumac (*Rhus aromatica*) displayed thin yellow spikes of blossoms. I noticed that the lower branches lying on the sand bloomed a week earlier than the upper ones, the warming up of the sand doubtless being the cause.

The country a few miles back from Lake Michigan, especially in the region of the Des Plaines river, has an earlier season than the lake shore by a week or ten days. Here were found about the middle of April *Hepatica triloba*, var. *acutiloba*, Blood-root (*Sanguinaria Canadensis*), the white Dog-tooth Violet (*Erythronium albidum*), the Rue Anemone (*Thalictrum anemonoides*), *Dicentra cucullaria* and *Claytonia Virginica*. Old collectors report *Isopyrum biter-*

ernatum from this region. We may add to our list also the following, collected May 1st at Graceland suburb, a few miles north of the city: Of Violets, four species, viz., *Viola cucullata, V. blanda, V. pedata*, and *V. sagittata*; Marsh Marigold (*Caltha palustris*), *Ranunculus fascicularis*, the Wood Anemone (*A. nemorosa*), *Phlox bifida, Antennaria plantaginifolia, Arabis lyrata, Cardamine rhomboidea*, var. *purpurea*, and *Trillium cernuum*. A week later were found *Uvularia grandiflora*, and *Polemonium reptans;* and at Hyde Park suburb, the American Cowslip (*Dodecatheon meadia*), the Hoary Stone-seed (*Lithospermum canescens*), the Larkspur Violet, (*Viola delphinifolia*), the Lance-leaved Violet (*V. lanceolata*), the wild Lupine (*Lupinus perennis*), Wood Rue (*Thalictrum dioicum*), and Yellow Star-grass (*Hypoxis erecta*).

Along the lake shore here the Bearberry (*Arctostaphylos uva-ursi*) was beginning to bloom, but to our disgust was speedily scorched and blackened by a fire kindled on the shore by some vandals.

Valeriana edulis was found in an old fenced field hereabout in the greatest abundance, the plants apparently of great age, forming solid woody clumps, half a foot in diameter. The great abundance of this plant here, though sparingly found elsewhere, almost seriously suggested the notion of cultivation by the Indians in time past. The white Lady's Slipper (*Cypripedium candidum*) seems to find a congenial home in association with this plant, for a week later over a hundred specimens were collected in this field. Like its companion, it is not common, but occurs abundantly in a few places.

A trip to the rich wooded district along the north branch of Chicago river about May 15th was quite fruitful, yielding the following species: *Ranunculus abortivus, Viola pubescens* (a form with remarkably large and beautiful flowers), *Dentaria laciniata*, the Creeping Crow-foot (*Ranunculus repens*), wild Turnip (*Arisæma triphyllum*), *Trillium recurvatum*, Blue Cohosh (*Caulophyllum thalictroides*), Red Cohosh (*Actea spicata*), Feverwort (*Triosteum perfoliatum*), wild Geranium (*Geranium maculatum*), wild Gooseberry (*Ribes hirtellum*), wild Black Currant (*Ribes floridum*), May Apple (*Podophyllum peltatum*), Five-finger (*Potentilla Canadensis*), wild Ginger (*Asarum Canadensis*), Scarlet Thorn (*Crategus coccinea*), Black Thorn (*C. tomentosa*), wild Crab Apple (*Pyrus coronaria*), Shad-bush (*Amelanchier Canadensis*), wild Plum (*Prunus Americana*), wild Black Cherry (*P. serotina*), Bur Oak (*Quercus macrocarpa*), White Oak (*Q. alba*), Red Oak (*Q. tinctoria*), Red Elm (*Ulmus fulva*, in fruit), Blueberry (*Vaccinium Pennsylvanicum*), Black Huckleberry (*Gaylussacia resinosa*), with that little oddity, the False Mermaid (*Floerka proserpinacoides*), in great abundance.

The procession of the flowers from this date to the close of May this season was astonishingly rapid, fully ten days in advance of the usual time. At Calumet, fourteen miles from the city, we found the delicate Bluets (*Houstonia cerulea*) and Sweet Fern (*Comptonia asplenifolia*). This peculiar locality affords rarities throughout the season; while Glencoe, a somewhat distant collecting ground, yields us now the Buffalo-bush (*Shepherdia Canadensis*). Along the lake shore we find on sandy hillocks two species of Prunus in bloom, the Choke Cherry (*P. Virginiana*), and the Sand Cherry (*P. pumila*). The shrubs of the latter are apparently very old, and of remarkable size for the species, some being from *three* to *four feet* in height. The Dwarf Birch (*Betula pumila*), is now to be found sparingly in the region of Rose Hill suburbs.

An excursion to Hyde Park (May 29th) afforded, among other things, Golden Alexanders (*Zizia integerrima*) and *Thaspium aureum*, a handsome wild Coreopsis (*Coreopsis lanceolata*), the large Yellow Lady's Slipper (*Cypripedium pubescens*), Blue-flag (*Iris versicolor*), Cynthia Virginica, the Painted Cup (*Castilleia coccinea*), yellow and scarlet varieties, Spider-lily (*Tradescantia Virginica*), Large Alum-root (*Heuchera hispida*), Marsh Pea (*Lathyrus palustris*), Beach Pea (*L. maritimus*), and wild Columbine (*Aquilegia Canadensis*). The beautiful little *Collinsia verna* has been collected at the Des Plaines river.

In several excursions during the latter part of May the following were collected: In fruit, the Witch Hazel (*Hamamelis Virginica*), unexpectedly found near the city. In flower, at the same locality, the High Cranberry-bush (*Viburnum opulus*), supposed to be the original of the Snow-ball of the gardens, the Sweet Viburnum (*V. lentago*), and wild Sarsaparilla (*Aralia nudicaulis*). To this list we will only add the wild Indigo plant (*Baptisia leucophea*), wild Hyacinth (*Scilla Fraseri*), Water Crow-foot (*Ranunculus multifidus*), Seneca Snake-root (*Polygala Senega*), Maple-leaved Viburnum (*V. acerifolium*), Small-flowered Honey-suckle (*Lonicera parviflora*), and the Small-flowered Lady's Slipper (*Cypripedium parviflorum*).

BOTANICAL MISCELLANY.

At a meeting of the Philadelphia Academy of Sciences, Mr. Thomas Meehan said that "no one who examined the prevailing theories concerning the formation of bark and wood with numerous living specimens before him, could be satisfied that these theories were in all respects correct. He had made numerous observations during the past year, which satisfied him that at any rate we had much to learn. He hoped to present these observations to the members at some future time, but at present wished only to direct their attention to a portion of a trunk of *Yucca alæfolia*, which he exhibited, the structure of which, he suggested, could not be accounted for on any theory generally known. The general idea was that the sap of plants ascended through the system, and was elaborated in the leaves, where the woody matter was formed, and afterwards descended—in exogenous plants forming a regular concentric layer over the last year's wood, and in endogenous structures returning by the interior, pushing these descending columns of wood through the mass of cellular matter without order or system. It would be seen that in this endogenous *Yucca* the woody matter, if it ever descended at all, as our present belief demanded it should do, had descended in a very regular and beautiful manner; quite as systematic, in fact, as most exogens would do. The wood was arranged in annual rings, not entirely concentric, but some tropical exogens did not have the woody annual layers always forming an entire circle any more than in this. In this case the annual layers of wood extended about two-thirds of the distance round the axis, and such layer was about the eighth of an inch thick. These annual layers were made visible by the bundles of fibres being packed more closely together towards the end of the season's growth, just as they are in exogens, from which, indeed, there was very little to distinguish this structure on a cursory examination but the absence of the so-called medullary rays."

The active botanists of New York city have organized a botanical club, which they designate the Torrey Botanical Club, in honor of the distinguished New York botanist, Dr. John Torrey. The club publishes a monthly *Bulletin*, the object of which is "to form a medium of communication for all those interested in the flora of this vicinity, and thus to bring together and fan into a flame the sparks of botanical enthusiasm at present too much isolated." We hail the advent of every such society as an indication of a growing interest in Natural Science, and as a means of increasing the number of learners and observers, and of thus directing into worthy channels much otherwise misemployed time and talent. We select from the *Bulletin* a few items which we presume will be of interest to our readers.

Aristolochia serpentaria, L.—Mr. Wm. Bower has in his garden, in Newark, a plant of this species, which, beside the regular flower, sends up a number of small buds with flowers that do not open, somewhat in the manner of *Specularia perfoliata*, probably for self-fertilization. The same kind of flowers may be observed in the case of many well-grown wild plants of this species. These flowers, however, form perfect seed-pods. It would be interesting to examine whether *Asarum Canadense* has also two sorts of flowers. Mr. Bower was the first to call my attention to this peculiarity, and I cannot learn that it has ever been noticed before. Judging from the plants I have seen, it would appear that seeds in greater abundance, and perhaps more perfect, are produced by these hermaphrodite flowers. In the similar case of *Amphicarpæa monoica*, Nutt, I have found sometimes quite a number of pods with apparently well-formed seed. On the other hand *Apios tuberosa*, Mœnch, seems to compensate by its tubers for the very frequent abortion of its pods. These plants, with others, *Specularia* for example, afford an interesting subject for investigation on this point. W. H. L.

Flowering of the Darlingtonia.—Dr. Torrey kindly gave me, early last winter, one of the several specimens of *Darlingtonia*, which he received from a correspondent in California. An empty aquarium tank was converted into a small conservatory for it, and it was planted in a mixture of swamp mud and sphagnum, the top of the tank being covered with a glass plate. The plant was kept in a cold room, where the moss was slightly frozen several times during the winter. The plant flowered early in April, and the specimen was placed in the hands of Dr. Torrey, to allow him to confirm his original observations, made upon dry materials, and he will probably add what may be necessary to complete the history of this interesting plant. G. T.

We learn from a correspondent (Mr. John Williamson) that New Albany, Indiana, has a Society of Natural History which has about 200 members that pay their dues and are interested in its welfare. Geology, Entomology, Conchology, Botany, etc., are represented by gentlemen well posted in those various branches. We believe some gentlemen of Louisville, Ky., also intend organizing a society. Dr. E. S. Crozier, of that city, edits a column of Popular Science in the *Louisville Commercial*.

Errata.—Page 288, column 2, line 12, for "*Fraximus*" read "*Fraxinus;*" same column, line 22, for "apetatous" read "apetalous;" same column, line 23, for "*Acu*" read "*Acer*."

DESCRIPTION OF QUERCUS LEANA.

BY DR. F. BRENDEL, PEORIA, ILL.

[Fig. 199.]

Quercus Leana, Nutt.

Quercus leana, Nutt, is a biennial fruited Oak, with deciduous leaves, which are obovate and mostly three-lobed at the apex, the lobes are bristle-pointed, tomentose when young, at last becoming nearly smooth. The fruit is short peduncled, single or in twos, the cup hemispherical, with a conical scaly base, half an inch wide; the acorn globular, half an inch long, about half immersed.

This Oak seems to be a hybrid between *Q. imbricaria* and *Q. coccinea;* the general appearance is that of the former; the leaves are nearly entire, but the texture is not so firm as in *Q. imbricaria*, and of the old ones both sides are glabrous, when in a young state they are more tomentose, so that on the upper side the nervation is often hardly visible, as in *Q. coccinea*, to which it approaches in the much smaller fruit, the cup being deeper than that of *Q. imbricaria*, the scales looser and more distinct; the acorn has at the apex a blunt conical knoll, which in *Q. imbricaria* is smaller projecting from a flat areola. The bud is ovate, conical, slightly five-ridged, and less tomentose than in *Q. coccinea*, whereas in *Q. imbricaria* it is more rounded and smooth.

A tree of this species in Hancock county has been known many years; besides it there are two others in Illinois: one in Fulton county and one near Peoria—the latter in the neighborhood of its supposed parents. From its similarity to *Q. imbricaria*, it is likely to be overlooked, and may perhaps yet be found in other places.

EUROPEAN CORRESPONDENCE.

We present our readers some extracts from a letter of Mrs. Kate N. Doggett, of Chicago, now in Europe. Mrs. Doggett is an enthusiastic Naturalist, and has made large collections in Botany and other departments of Natural History. There are hundreds of ladies in our large cities who have time and means to devote to mental cultivation and the acquirement of useful knowledge. How much refined pleasure these ladies might find in the study of Nature. An active and interesting Botanical Society has been in operation for some time past in Chicago, embracing not only professional men, but also several ladies who are heads of families, showing that even maternal cares do not necessarily interfere with continued mental culture. When shall we have Botanical Societies in all our large towns and cities which shall interest both ladies and gentlemen who have leisure for such pursuits? Why should ladies leave all systematic pursuit of education when they leave their schools? We hope the day will come when it will be *fashionable* for ladies to take an interest in societies for the promotion of science.

BRIENZ, SWITZERLAND, May 3d.

Your letter came to me just as we were leaving Tunis, and this is the first moment I have had to answer it. * * * As yet I have not been able to collect any sea-mosses, although we have been nearly all winter on the shores of the Mediterranean, but in towns where, of course, were no beaches; but very soon we go to the British Isles, and there I hope to do better. You are quite right in thinking I had not lost my interest in Botany. I do not believe that I shall do that till I lose my interest in life. A few months before we left home a half dozen

persons formed themselves into a Botanical Society, doing me the honor to make me their president. When I left we numbered a dozen. Prof. Beal is the vice-president, and he is doing much in Chicago to interest his pupils in the study of Botany. * * * * We spent five weeks in the north of Africa, which is one grand flower garden, and wished we could lengthen the weeks into months. At Algiers we made the acquaintance of Signor Durande, an Italian, who has lived in Africa for twenty years, and has been one of the most important contributors to the "Botany of Algeria," now publishing by the French Government. But, like all works brought out by government, it progresses very slowly, and will be so expensive it will benefit but few. For years Mr. Durande has done what I would like to have you do, and what will, I think, do much to excite interest in the study of Natural History, particularly among women. Something akin to it was initiated long ago in Salem, by the Director of the Institute, and has been so successful that nearly every person in Salem knows something of Natural Science. One day in the week Mr. Durande makes an excursion to some place in the vicinity of Algiers, taking with him such students of the Medical College with which he is connected as choose to accompany him, and gentlemen and ladies living in the city or strangers sojourning there. We had the pleasure of joining two of these excursions; one to Blida, whither we went by rail, and one to Cape Matifou, to which we drove. Our party was made up of Danes, French, Germans, English and Americans. At Blida, one of the loveliest spots imaginable, perfectly embowered in orange groves, we explored the Botanical Garden (the like of which is not in all America, and you must recollect that so far as anything of this sort goes Algeria is but forty years old), several private gardens, and a wild ravine whose rocks were covered with mosses, ferns and lycopodia, Mr. Durande telling us names and explaining affinities, modes of culture, &c., &c., in the most charming way. At Cape Matifou we gathered flowers, one gentleman and lady collected shells, some sketched the ruins of the Roman city of Rusconia, which sent a bishop to the first Christian council; and we had a most enjoyable day, to say nothing of the profit we derived from the teachings of Sig. Durande, and the conversation of intelligent people from different parts of the world.

NOTES FROM CORRESPONDENTS.

A Natural Graft Hybrid of *Quercus alba* and *Q. tinctoria*.—I was recently informed of a remarkable "Indian graft of a Black Oak on a White Oak," in the neighborhood of Petersburg, Ill., and having the almost incredible story from good authority, I was induced to visit the locality to learn if it was really true. To my great regret I found the tree prostrated by a storm, apparently about two years ago, and the top principally hauled off for fuel, but that portion where the union was formed, and the smaller portions of the limbs of the hybrid were left on the ground. The story of the Indian graft I found to be current in the neighborhood, and numbers of people knew all about it. It appears that the union was formed in a portion of the top of the White Oak about fifty-five feet from the ground, and, judging from the layers of wood, about 75 years ago. It seems that the Black Oak (*Quercus tinctoria*, for such it really appeared to be) had fallen into the White Oak—as was evident from the remains of a decayed limb and the positions of growth—and had by some unaccountable means united with it, and had grown from the point of union a huge branching limb, more than twice the diameter of the limb of the White Oak upon which it was attached. No remains of a tree of *Quercus tinctoria* was now in reach of the White Oak upon which this remarkable graft was growing, and the most probable explanation of the *modus operandi* is that *Quercus tinctoria*, when falling, had dashed a rather large limb into the fork of the White Oak top with force enough to remove the bark from both species, and being so firmly pressed by the fork that a union was effected.

But what will most interest the botanist is, that the graft clearly shows hybridism. Of course no leaves could now be had, but the wood, bark and buds appear about equally to belong to both species, *Q. alba* showing strongly in the smaller limbs, and the rough bark of *Q. tinctoria* most fully developed at the point of union and grading to the smaller limbs, where it may be said to insensibly disappear. This interesting and remarkable production may be recorded as adding another to the few known graft hybrids in the vegetable kingdom.

ATHENS, Ills. E. HALL.

P. S.—Tell your correspondent, G. H. French, that I will "go the cider" that his remarkable tree (described in the June number) is the Kentucky Coffee tree (*Gymnocladus Canadensis*).

Botanical Notes.—MR. EDITOR: In complying with your request for botanical notes from this portion of the State, I will confine myself, for the present, to the counties of Union and Jackson—a region not less interesting to the botanist for the number and peculiarity of its species, than to the tourist for the beauty of its scenery.

It embraces a range of nearly 2,500 vertical feet of geological strata; and, as the drift formation is generally absent, the soil is made by decomposition of the underlying rocks, and varies widely in character according to the rocks from which it is formed and upon which it rests.

From the Mississippi bottoms upon its western border—but little above the level of the Ohio at Cairo—it rises to the Cobden hills, among the highest in the State; and its surface varies from the lagoons and swamps of the former to the rocky and precipitous bluffs of the hill country in the west. Its southerly situation gives it a genial climate, and the great comparative height to which portions of it are elevated protects them from late and early frosts. Consequently we find here an unusual variety of species, many of them not known elsewhere north of the Ohio river, and nearly all of them appearing from two to six weeks earlier than the dates given in Gray's Manual. In the small portion of these counties which I have been able to examine, I have observed—exclusive of forest trees, grasses, sedges and mosses—450 species, representing 290 genera and 90 orders.

The region may be conveniently divided, for the purposes of these notes, into the hills and bluffs, the creek bottoms, and the Mississippi bottoms, each of which has a more or less characteristic flora. Upon the

first are chiefly found our ferns. Of these I have collected 25 species, including the *Polypodium incanum*, *Cystopteris fragilis*, *Cheilanthes vestita*, *Osmunda Claytoniana*, *Camptosorus rhizophyllus*, *Asplenium pinnatifidum*, *trichomanes* and *ebeneum*, *Aspidium Goldianum*, *Allosorus*, *Pteris*, etc. Of the last, a variety occurs quite frequently which is peculiar in lacking the ternate character of the frond. This variety has propagated itself without change for three years since I first observed it.

It is along the borders of the bluffs, however—which here repeat in miniature the cascades and precipices of mountain scenery—that we obtain the most interesting results. Here the soil is mostly shaded by the overhanging trees, warmed by the heat reflected from the rocks, and moistened by the dripping surface waters carried off by the underlying strata. In such places only have I found, at Cobden, the *Phacelia Purshii*, remarkable for the delicate beauty of its light-blue, deeply-fringed corolla, and at Makanda the *Mitchella repens*, which seems to flourish with us rather where it receives the constant drippings of the rocks than in dry woods, as farther east. Along the bluffs and upon the rocky hill-sides occurs also the *Azalea nudiflora*, described by Gray as growing in the eastern swamps. The profusion of light-pink blossoms which this shrub puts forth in early spring, lighting up the gloomy forests of the Pine Hills, or drooping in fragrant, cloud-like masses from the summit of the lofty cliffs, forms a feature of unusual beauty in the scenery of our opening year. Later in the season, the hill-sides are blue with the *Dipteracanthus strepens* and *D. ciliosus*, which remain in bloom until autumn, and in thickets the *Clitoria Mariana*, the largest of our leguminous flowers, is frequently met. The *Agave Virginica* and *Vaccinium arboreum* occur only among the dry hills, and the *V. vacillans*, with its pleasant fruit—erroneously called a huckleberry throughout the country—is quite common in the same situations. This last occurs especially among the Pine Hills, on the eastern borders of the Mississippi bottoms.

This region consists of a succession of sharp ridges of chirty limestone, separated by narrow, steep ravines; and frequently terminating, towards the river, in nearly vertical bluffs, from 100 to 500 feet in height. Its flora partakes to a great extent of its geological peculiarities, and many plants found sparingly elsewhere seem to have spread from these hills as a centre. Peculiar to them alone, so far as I have seen, is the Yellow Pine (*Pinus mitis*), found almost exclusively upon the summits and southern slopes of the ridges mentioned, the *Viola pedata*, *Verbena aubletia*, etc.

On the Makanda bluffs, which are frequently fringed with cedars, grows the *Corydalis aurea*, a *Saxifraga* resembling the *erosa*, but apparently not identical with it, and a *Heuchera* of a species unknown to me, specimens of which I sent you recently. Among others more widely scattered I might mention *Ascyrum crux-Andreæ*, *Sagina apetala*, *Rhus aromaticum*, *Trifolium reflexum* (which I have also found scattered in single stools through low woods in Franklin county), *Passiflora lutea* and *Physostegia Virginiana*. The Passion vine (*Passiflora incarnata*) has also been found upon the hills near Jonesboro, and grows readily in the open air. The *Physostegia* is one of the finest of our wild flowers—one of those "which no lady's garden should be without." In cultivation it grows three or four feet high, sending up a cluster of stout stems, each bearing a close, four-ranked, usually compound, spike, six or eight inches long by two or three in thickness. The flowers are a light rose-color, marked with purple spots, and when massed in bloom are notable for their light and airy elegance.

I will write you further of the lower lands and of the forest trees at another time. S. A. FORBES.

Pine Barren Plants.—Who, except a botanist, would ever dream of the hidden floral treasures to be found in the uninviting, dreary-looking pine barrens of New Jersey? The hills and rocks of New England, the fine woodlands of the middle and western States, and the rich prairies of the West, must all yield the palm to the despised pine barrens of New Jersey for rare and beautiful plants.

Years ago, every now and then a charming plant would reach me in my wanderings, labeled "pine barrens, N. J." Surely such exquisite flowers must come from some enchanted fairyland; but no, there was the unmistakable label, with the portentous word "pine barrens;" so my dream of fairyland vanished amid the white, dreary sand of South Jersey. Still, with each sight of these beautiful flowers would come a longing to visit the home of their birth.

My first excursion in the "barrens" was early in April, when, after a wearying march through brush and briers, in damp places, I suddenly came upon the little trailing evergreen, *Pyxidanthera barbulata*, Michx. This charming little plant is found in the natural Order *Diapensiaceæ*. Botanists give us only two plants in this order, and by many authors these two are made to form each a genus by itself. *Diapensia Lapponica*, L., is a little Alpine plant found in the north of Europe and in the northern parts of our own country; but our little pine-barren *Diapensia*, or, according to Gray and other authors, *Pyxidanthera*, is the one under consideration. It is so limited in its extent that it has never received a pet name, but no plant more deserves some common name suggestive of its rare loveliness.

True, I had received dried specimens of this plant, and thought it very pretty; but I was not prepared for the enchanting, graceful loveliness that rewarded me for my laborious search. It was growing in thick masses, studded all over among its numerous, tiny, bright green leaves with pinkish and white buds, with now and then a fully expanded blossom. It seemed like sacrilege to disturb it, hidden away as it was from human eyes, and called forcibly to mind Emerson's exquisite little poem "Rhodora."

"In May, when sea-winds pierced our solitudes,
I found the fresh Rhodora in the woods,
Spreading its leafless bloom in a damp nook,
To please the desert and the sluggish brook.
The purple petals, fallen in the pool,
Made the black water with their beauty gay;
Here might the red-bird come his plumes to cool,
And court the flower that cheapens his array.

"Rhodora! if the sages ask thee why
This charm is wasted on the earth and sky,
Tell them, dear, that if eyes were made for seeing,
Then beauty is its own excuse for being:
Why thou wert there, O rival of the rose!
I never thought to ask—I never knew;
But, in my simple ignorance, suppose
The self-same Power that brought me there brought you."

In April and May we find in most of the shallow ponds among the barrens a curious water plant, which, although it cannot be strictly called a pine barren plant, yet, from its limited extent and interesting character, requires a passing notice. Its scientific name is *Orontium aquaticum*, L., and it has received the very appro-

priate common name of Golden Club. It is found in the natural order *Araceæ*. The leaves are large, ten or twelve inches in length and about half as wide; the upper surface of the leaf is a light velvety green, the under surface much paler, and very smooth and shining, on long radical petioles; from the midst of these leaves arise several scapes, or flower-stalks, which, from the base up to within a few inches of the top, are of a dusky purplish color, which gradually fades into the purest white, terminating in a rich golden-yellow spadix, covered with small, perfect yellow flowers.

Leiophyllum buxifolium, Ell., is another charming pine-barren plant, and has received the characteristic common name of Sand Myrtle. It belongs to the order *Ericaceæ*, with our splendid Azaleas and Rhododendrons, which the European florists have coaxed into numberless varieties. Possibly this beautiful little shrub will be neglected by us until the European florists sell it back to us at high figures, as they already have many plants of this family.

The *Leiophyllum* is an evergreen shrub, with leaves small, dark green, very smooth and shining, and strung thickly along the stems, which in May are terminated with thick, umbel-like clusters of small white or pinkish flowers. Gray and other botanists give the height of this shrub at from eight to ten inches, and this is its usual height on the dry sandy barrens; but in Atlantic county, near the coast, in damp soil, I found an acre or more of this shrub with an average height of about three feet. I found it while in full bloom, and it stood so thick as to exclude almost everything else. It was surrounded by a thick, almost impenetrable, tangled mass of shrub-growth, bound together by the climbing prickly Smilax, through which I forced my way, and was more than repaid for my toil by the beautiful sight, which can never be effaced from my memory.

One of the most stately and beautiful pine-barren plants is *Xerophyllum asphodeloides*, Nutt. It is an Endogenous plant, and found in the order *Melanthaceæ*. The foliage consists of a thick tuft of grass-like leaves, from the midst of which arises a single flower-stalk, from three to four feet in height, bearing a dense raceme of showy white flowers. It is found in moist places, and commences blooming in May. Mr. Fuller, of *Hearth and Home*, remarked on first seeing this plant, that this alone was worth taking a trip from New York to see; and, florist as he is, this remark is a sufficient guarantee of its rare loveliness.

But I would not have the reader think that the pine barrens exclude the charming flowers of his acquaintance: From the latter part of March all through the month of April, the air is redolent with the sweet fragrance of the Trailing Arbutus (*Epigea repens*, L.), growing with a rich luxuriance in the white sand, with a simple mulching of oak and pine leaves. Also the delicate, early little Wind-flower (*Anemone nemorosa*, L.) is found in abundance, with the ever-present, aromatic Wintergreen (*Gaulthera procumbens*, L.), with its shining green leaves and bright scarlet berries. The little trailing Partridge vine (*Mitchella repens*, L.), with its scarlet twin berries—like the Wintergreen remaining on the plant all winter—greets us often in our early spring rambles. As the season advances so does the number of beautiful plants increase among the seemingly dreary pine barrens, of which I will try to make further report from time to time.

MARY TREAT.

ANSWERS TO CORRESPONDENTS.

Plants to Name—*H. W. Patterson, Oquawka, Ills.*—No. 1, *Thaspium barbinode*, Nutt.; No. 2, *Glyceria nervata*, Trin.; No. 3, *Erigeron strigosum*, Muhl.; No. 4, *Carex Meadii*, Dew.; No. 5, *Œnothera fruticosa*, L.; No. 8, *Koeleria cristata*, Pers.; No. 9, *Panicum pauciflorum*, Ell.; No. 11, *Carex hystricina*, Willd.; No. 12, *Erigeron Philadelphicum*, L.; No. 13, *Cryptotænia Canadensis*, D. C; No. 14, *Melica mutica*, Walt.; No. 21, *Hordeum pusillum*, Nutt.; No. 22, *Ptelea trifoliata*, L.; No. 27, *Hydrophyllum Virginicum*, L.; No. 28, *Osmorrhiza longistylis*, D. C.; No. 29. *Polytænia Nuttallii*, D. C.; No. 30, *Sanicula Canadensis*, L.

Huron Burt, Callaway, Mo.—No. 1, Annual Spear-grass (*Poa annua*, L.) This is probably an introduced grass—it seems to follow in the line of advancing civilization. It is too small to be productive as a meadow grass. Mr. C. L. Flint, author of a "Practical Treatise on Grasses," says: "This modest and beautiful grass flowers throughout the whole summer, and forms a very large part of the sward of New England pastures, producing an early and sweet feed exceedingly relished by cattle. It does not resist the drought very well, but becomes parched up in our pastures." It is called an annual, but comes up as you say in the fall from seed, ripens its seeds the ensuing summer and dies. No. 2, the common Rush-grass (*Juncus tenuis*, L.), very well characterized as "Wire-grass," and of little practical value. No. 3 is called Cleavers, or Goose-grass, (*Galium aparine*, L.) though not properly a grass, but a plant of the Madder family (*Rubiaceæ*). No. 4 is the omnipresent Knot-grass, or Goose-grass (*Polygonum aviculare*, L.), which everywhere takes possession of door-yards and paths, and thrives under the roughest treatment.

Geo. L. Bodley, Battle Creek, Mich.—The leaves you send are those of the Red Mulberry (*Morus rubra*, L.) On mature trees the leaves are seldom lobed, being ovate heart-shaped.

Chas. E. Billen, Philadelphia.—No. 12, the cultivated Poet's Narcissus (*Narcissus poeticus*). No. 11, *Sedum ternatum*, or Three-leaved Stone-crop, growing wild in rocky woods, also occasionally found in gardens, and often erroneously called a Moss. No. 13, *Viburnum prunifolium*, or Black Haw, a large and handsome shrub or small tree. No. 14, Winter Cress (*Barbarea vulgaris*, L.) No. 15, Daisy Fleabane (*Erigeron bellidifolium*, Muhl.) No. 16, Wild Geranium (*Geranium maculatum*, Linn.)

J. L. Townsend, Marshall, Mo., asks for information on the following subjects: 1st, Time to commence studying botany, whether summer or winter. 2nd, Books needed, their price, and where they can be purchased. 3rd, Magnifying glass, the size, number of lenses, where to be obtained, and price. 4th, Microscope for that class of students who wish to pay attention to the Cryptogamia, kind, price, and where obtained. 5th, Collecting box, size, material and cost. 6th, White printing paper, cost, whether best purchased of printers or dealers. 7th, Hints on preserving ripened capsules and seeds, so that the pressure will not scatter them. 8th, How to get the flowers and fruit from high trees. 9th, Books for the special students, and works describing the medicinal plants for those who would be inter-

ested in this class. 10th, Kind of box, case, or cabinet in which to place the holders containing the specimens, and whether to let them remain loose in the holders or fasten by mucilage or otherwise. 11th, Make of knife to use in dissecting plants. 12th, Full directions about making a portfolio for collecting specimens when on a journey. 13th, Method of preparing stone-fruits, so that they can be shown when ripe. 13th, How to examine dried specimens.

This is quite a formidable list of questions, but we will take them up *seriatim*, and answer as well as we are able.

1. The best time to commence studying botany is during the period of vegetable growth, when plants can be observed in a living state. Certainly something can be learned about plants by simply reading or studying the text-books; and we know that some teachers prefer to have their classes commence in the winter term and study morphology, physiology and classification, and then in the spring term enter upon the analysis of plants. This is probably a good plan for colleges and schools, for all the analytic botany that is obtained there is that obtained during the spring term, as the schools generally close in June, and do not reöpen until September, when the best part of the season has passed away.

2. There is no lack of good books on structural botany. No man has done more to extend the knowledge of botany in the United States than Prof. A. Gray, whose series of botanical works are not to be excelled. Prof. Wood has also a number of excellent works on the same subject. Students of Botany in that part of our country lying east of the Mississippi river will find in the Manual of Dr. Gray and the Class-book of Prof. Wood descriptions of nearly every plant they will be likely to find, exclusive of the lower cryptogamic orders. As we go westward of the Mississippi river, we find species which are not described in the works mentioned; these species become more and more numerous as we advance to the Rocky Mountains. Botanical students in that region of country will be unable to identify many of the plants they meet with. Probably within a few years some work will be published embracing all our vast territory. We have not at hand a list of prices of the botanical works we have mentioned, but they may be obtained through the booksellers of the country.

3. Good pocket lenses of two or three glasses may be obtained in most large towns. These will answer for the ordinary purposes of botanical investigation. There is a very neat arrangement of lenses, called Dr. Gray's microscope for the use of botanists, so contrived that the lenses may be fixed on a standard, and both hands left free to manipulate the object. This, we believe, costs from $2.50 to $4.00; but we do not know the manufacturers.

4. That class of students who wish to study cryptogamic plants, and to investigate the minute structure of the cells and tissues, etc., will need a compound microscope. We are hardly prepared to recommend any particular kind, further than to say that we would buy an American instrument. Excellent ones are made at Philadelphia, Boston, and other places; Chas. Stodder, 66 Milk street, Boston, advertises microscopes in the *American Naturalist*, and will undoubtedly furnish price lists, etc., on application.

5. The common collecting box is made of tin, in a cylindrical form, about two feet long and six inches in diameter, with a door or lid nearly the whole length. Specimens may be collected in this box, and if moistened will keep fresh for a day or two, and may be analysed at leisure. A box of this kind is especially useful to collect and keep material for analysis by a class; but most botanists, we apprehend, after a time drop the tin box and employ the portfolio, or collecting book. This is made of strong binder's board, eighteen or twenty inches long and ten or twelve wide, and may be either a simple cover, to be filled with loose sheets, or the sheets may be bound in with blank pieces after the manner of a scrap-book. The paper should be a strong, smooth and thick manilla. Into this book the specimens should be placed when collected, and may remain there several hours, or a day, until an opportunity occurs to transfer them to the press. The book may be fastened with straps and buckles at the side and ends, and a handle may be attached for convenience of carrying.

6. White printing paper may be procured either of printers or dealers, as may be most convenient. The price varies with the quality; it is usually sold by weight, or rather the price per ream depends on the weight.

7. Specimens containing capsules or pods should be collected before the fruit-vessels are fully ripe, when little trouble will usually be experienced from their bursting. If, however, the seed is likely to be scattered, it may be kept in a small paper sack, in the same paper with the specimen. Indeed, it is a good plan to have some seeds of every species kept in this way for ready examination. In cases where the seeds are too large, as in the oaks and hickories, they may be kept in suitable boxes, properly labeled and numbered.

8. For getting specimens of flowers and fruit from high trees, the usual mode is by climbing. Nurserymen and orchardists have contrivances, such as shears attached to a long handle, long-handled chisels, etc., which might be turned to advantage in some cases.

9. Students wishing to pursue only special departments of botanical investigation will require special works—as, for instance, Sullivant on the Mosses and Liverworts of the United States; Harvey on the Marine Algæ of North America. The medical uses and properties of our plants are treated of in the American Dispensatory, the Eclectic Dispensatory, Bigelow's American Medical Botany, and probably in other works with which we are unacquainted.

10. As to the final disposition of plants in the Herbarium; some keep them in folios, some in pasteboard boxes, and some in drawers. In every case they should be excluded from sunlight, and from the approach of insects. Wherever the collection cannot be made stationary and permanent, it will be better to use pasteboard boxes. At some future time we will give details. We will only say now that the specimens should be gummed to the sheet, either by the direct application of mucilage, or by means of narrow strips of gummed paper fastened across the stems of the plants at suitable intervals. We prefer the latter method.

11. We know of no special pattern of knife for dissecting plants. Any one with a sharp, thin blade will answer most purposes.

12. This has been answered under No. 5.

13. We know of no better way of preserving stone-fruits than by drying or keeping in alcohol.

14. In order to examine dried specimens, the flowers and small parts must be first thoroughly softened by immersion in hot water, or by means of steam. They may then be dissected in the usual way.

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